THE STRUCTURE AND CORRELATES OF THE COOPERSMITH SELF-ESTEEM INVENTORY

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J.M. Lawton

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ABSTRACT

This thesis examines the measurement of self-esteem in children using the Coopersmith Self-Esteem Inventory (SEI). The aims of the research are:

(i) To assess the structure, reliability and validity of the SEI.

(ii) To identify the social, cognitive and demographic factors associated with self-esteem.

The study is based on a sample of 843 ten year old children who were participating in a larger study of child development.

Chapter 3 presents a confirmatory factor analysis of the SEI. The analysis revealed that:

(i) The structure of the SEI was consistent with an hierarchical model in which four specific factors of self-esteem were subsumed by a higher order factor of global self-esteem.

(ii) The test scores were contaminated by substantial random errors of measurement (unreliability) and systematic errors of measurement arising from defensiveness (invalidity).

Chapter 4 examines the relationships between self-esteem and the external variables, with the SEI scores corrected for unreliability and invalidity. The analysis showed that:

(i) The relationships between self-esteem and cognitive measures were confounded by the contaminating effects of defensiveness.

(ii) The specific self-esteem factors were related to external measures via the mediating factor of global self-esteem.

(iii) Measures of intelligence, school performance, school stability, and (to a lesser extent) gender, family socio-economic status and family living standards made significant contributions to variability in self-esteem. Other measures, including ethnicity and family breakdown had no direct effect on self-esteem.

(iv) These measures accounted for less than a quarter of the variance in self-esteem, suggesting that the primary determinants of self-esteem were not assessed.

The major conclusion of the analysis is that while SEI scores are relatively fallible measures, it is possible to obtain reliable and valid information about self-esteem from these scores by the use of appropriate analytical techniques. The implications of the present study for the direction of future research are discussed.

CHAPTER I

INTRODUCTION

1.1 AN INTRODUCTION TO SELF-ESTEEM

The concept of self-esteem has a long history in psychology. This history can be traced back to William James' pioneering text Principles of Psychology (1890), and to the early psychological theories of Cooley (1902) and Mead (1934). For some years after this, self-referent constructs were largely ignored in favour of the dominant behaviourist and functionalist psychologies, but as the popularity of these approaches waned, self-esteem once again became a focus of attention. This construct was accorded a fundamental role in several theories of personality, including those developed by Adler, Horney, Fromm, Maslow and Rogers (Wells & Marwell, 1976). However, it was not until the 1960s that serious efforts were made to measure self-esteem on an objective basis. Since this time there has been a proliferation of empirical studies of self-esteem based on child and adult samples (Wylie, 1974, 1979). Broadly speaking, this research has focussed on two major concerns.

The first concern has centred around attempts to construct reliable and valid measures of self-esteem. This line of research was initiated primarily by the work of Coopersmith (1959, 1967) and Rosenberg (1965) who devised measurement scales based on a self-reported

attitude approach. Numerous other researchers have developed self-concept measures since this time, and by 1972, it was estimated, that there were at least two hundred such instruments in use (Crandall, 1973).

The second major concern of self-esteem researchers has been the problem of identifying the antecedents and correlates of self-esteem. The result of this research is that self-esteem has been used as an explanatory construct in many theories, including theories pertaining to academic achievement (West, Fish & Stevens, 1980; Schierer & Kraut, 1979); ethnic differences (Chapman, 1984; Ranby, 1979; Zirkel & Gable, 1977); social class differences (Rosenberg & Pearlin, 1978); attraction (Dittes, 1959); causal attribution (Fitch, 1970); and delinquency (Kaplan, 1978; Rosenberg & Rosenberg, 1978). By the early 1970s Crandall noted that self-esteem "has been related to almost everything at one time or another" (1973: 45).

The general aim of this thesis is to contribute to the existing knowledge of self-esteem, by reporting the results of an empirical study involving a large birth cohort of New Zealand children. Broadly speaking, the empirical aims of the research are twofold:

(i) to clarify a number of issues relating to the structure, reliability and validity of a commonly used self-esteem measure: the Coopersmith Self-Esteem Inventory (SEI: Coopersmith, 1981).

(ii) to identify a number of social, educational and demographic factors which are associated with variation in childrens' reports of self-esteem.

This chapter presents a summary of the background to this research in four sections. The first section considers popular conceptual definitions of self-esteem, and the second section details some general problems associated with the measurement of self-esteem. This is followed by a discussion of the Coopersmith SEI, its reliability and validity, and the previous research which has been conducted with this instrument. The concluding section of the chapter develops the formal confirmatory factor model of the SEI on which the present research is based.

1.2 DEFINITIONS OF SELF ESTEEM

Over the years a number of theorists have attempted to define self-esteem. One of the earliest conceptual definitions was proposed by William James (1890) with his formula:

$$\text{Self-Esteem} = \frac{\text{Success}}{\text{Pretensions}}$$

According to James, self-esteem is determined by the discrepancy between one's actual accomplishments and one's supposed potentialities. Subsequent theorists have defined self-esteem as an attitude or set or attitudes (e.g. Rosenberg, 1965; Coopersmith, 1967). However, a number of reviewers (Shavelson, Hubner & Stanton, 1976; Wells & Marwell, 1976; Wylie, 1974) have noted that most definitions of self-esteem have tended to be of an informal, intuitive nature. Self-esteem,

> like many other psychological constructs, suffers in that 'everyone knows what it is' and researchers do not feel compelled to provide any theoretical definition of [it]. (Marsh et al, 1984: 940)

Shavelson, Hubner & Stanton (1976) have attempted to overcome this problem. The authors developed a precise, operational definition of self-esteem which integrated the common features of existing definitions and which was consistent with current research evidence. They postulated that self-esteem has seven critical features. It may be described as: structured, multi-faceted, hierarchical, stable, developmental, evaluative, and differentiable. Shavelson, Hubner & Stanton suggest that self-esteem is comprised of a large number of specific self-evaluations based on the individual's perceptions of his/her experiences and social interactions (i.e. it is multi-faceted). These evaluations are structured in an hierarchical fashion on the dimension of generality, with specific self-evaluations at the base of the hierarchy, and overall self-regard at the apex. While overall self-esteem remains relatively stable across time, the specific facets and the structure of self-esteem develop with age, becoming increasingly differentiated. The authors conclude that self-esteem is differentiable, in that it can be distinguished from related constructs such as anxiety and social desirability.

This definition of self-esteem is clearly the most comprehensive to date. It does, however, have one limitation. The authors fail to make a distinction between the terms 'self-esteem' and 'self-concept'. Shavelson, Hubner & Stanton argue that there is no clear conceptual distinction between these terms, and thus they tend to use the terms interchangeably. This approach has been

criticised by other researchers. For example, Fleming & Courtney (1984) argue that the self-concept is a more general term which subsumes self-esteem. They believe that self-esteem is concerned solely with the evaluation of the self. The self-concept, on the other hand, includes both self-evaluations and pure self-descriptions which are not necessarily judgemental.

In the present study, the term 'self-esteem' is favoured. This term was selected because the Coopersmith SEI, which is the focus of the present research, contains items "concerned primarily with the evaluation of self-worth, as opposed to self-identity or self-description" (Fleming & Courtney, 1984: 407). Hence the present study examines the overall "evaluation which the individual makes and customarily maintains with regard to himself" (Coopersmith, 1967: 4-5).

1.3 MEASUREMENT PROBLEMS

The central problem faced by measurement studies is essentially that of translating a general concept such as self-esteem into measureable scale variables which provide valid and reliable indices of the concept. Issues relating to the measurement of self-esteem are outlined below.

(1) Self-Esteem as a Latent Variable

An important distinction which has sometimes been overlooked in self-esteem research, is that all self-referent constructs

(self-esteem included) are non observed, hypothetical constructs or latent variables. As such, they can only be inferred on the basis of fallible, observed measures or indicators. This raises the important issue of establishing the rules of correspondence or epistemic correlations which exist between latent variables and the observed measures that purportedly represent these variables (Costner, 1969). A number of methods have been used to establish the relationship between self-esteem and its indicators.

The first approach to this problem, which has been widely used, is that of essentially ignoring the problem. Many authors have assumed that the conceptual definitions of self-esteem are sufficiently clear for items to be devised which provide adequate measures of self-esteem. In her review of the measurement of self-esteem up until 1972, Wylie (1974) notes that large numbers of studies have been conducted based on unvalidated instruments. The consequences of such loose methodology are illustrated by Shavelson, Hubner & Stanton's conclusion that:

> It appears that self-concept research has addressed itself to substantive problems before problems of definition, measurement and interpretation have been resolved. Until these problems have been dealt with ... the generalisability of self-concept findings will be severely limited and data on students' self-concepts will continue to be ambiguous. (1976: 410)

One of the more popular methods for exploring the adequacy of self-esteem measures is the use of exploratory factor analysis (e.g. Roberson & Miller, 1986; Gibbs & Norwich, 1985; Kokenes, 1978;

Smith, 1978; Edgar et al, 1974; Nicholls, 1967). Exploratory factor analytic methods rest upon statistical interrogation of the matrix of correlations between self-esteem items. Typically, evidence of unidimensional factors corresponding to the hypothetical structure of self-esteem is taken as evidence of the factorial validity of the measure.

However, in the last decade a number of refinements to the exploratory factor model have made this model more suitable for hypothesis testing. This approach is known as covariance structure modelling or confirmatory factor analysis. Unlike exploratory methods, confirmatory factor analysis enables the researcher to specify explicit models of the relationship between the non observed latent variables and the observed measures. The advantages of the confirmatory approach over the exploratory approach have been detailed by Long (1983a). Long notes, that for the exploratory model, the researcher is forced to make a number of assumptions.

> These assumptions are made regardless of the substantive appropriateness. Additional and generally arbitrary assumptions must then be imposed in order to estimate the model's parameters. The exploratory factor model's inability to incorporate substantively meaningful constraints, and its necessary imposition of substantively meaningless constraints, has earned it the scornful label of garbage in/garbage out (GIGO) model.
>
> The limitations of the exploratory factor model have been largely overcome by the development of the confirmatory factor model ..... In the confirmatory factor model, the researcher imposes substantively motivated constraints ... statistical tests can be performed to determine if the sample data are consistent with the imposed constraints or, in other words, whether the data confirm the substantively generated model. (1983a: 12)

In this thesis the major approach to establishing the relationship between a self-esteem measure (the SEI) and the latent construct of self-esteem, will be based upon an application of confirmatory factor modelling methods. It is also possible to use these methods to examine a number of more refined issues about the quality of the measure employed. The issues of measurement reliability and validity are discussed below.

(2) Reliability

> Fundamentally, reliability concerns the extent to which an experiment, test or any measuring procedure yields the same result on repeated trials. The measurement of any phenomenon always contains a certain amount of chance error .... But while repeated measurements .... never precisely duplicate each other, they do tend to be consistent .... This tendency toward consistency .... is referred to as reliability. (Carmines & Zeller, 1979: 11-12)

It follows that the variance of any given test may be divided into two components: the variance attributable to systematic, between-subject variation, which is often described as the 'true' variance of the test, and the variance attributable to random or non-systematic measurement error. The reliability of a test is defined as "the proportion of .... variance that is true variance" (Guilford & Fruchter, 1973: 397). More formally, the reliability of a test is given by the ratio:

$$r_{tt} = \frac{\sigma_t^2}{\sigma_T^2}$$

where σ_t^2 denotes the true or systematic test variance and σ_T^2 is the total (observed) test variance (Carmines & Zeller, 1979). The problem of estimating reliability amounts to securing an estimate

of the non observed true variance σ_t^2.

There are a number of methods available for securing an estimate of the systematic variance of a test. These include:

(a) Retest Method. For this method, systematic variance is estimated on the basis of two administrations of the test. A retest reliability coefficient is equal to the correlation between the test scores from the two administrations.

(b) Alternate Forms Method. This method involves the administration of two different, but ideally equivalent, forms of the test. Reliability is estimated by the correlation between the two forms.

(c) Split Half Method. This method involves a single test administration after which the total set of test items is divided into halves and reliability is taken to be the correlation between the halves (corrected for test length).

(d) Internal Consistency Method. This method is an extension of the split half method in which each test item is considered as a separate test, and reliability is estimated on the basis of inter-item correlations (Carmines & Zeller, 1979).
While it is relatively easy to secure estimates of the systematic variance of a test using these methods, a problem which is common to most measures of reliability is that they are presented in isolation from other aspects of the test. A more meaningful approach is to estimate reliability as a statistic of an explicit model linking the latent structure of the test to the observed data. This approach will be discussed in the final section of this chapter (Chapter 1: 1.5)

when a formal confirmatory factor model of the SEI is developed.

(3) Validity

While the definition of reliability leads fairly directly to methods for estimating reliability, the measurement and assessment of test validity tend to be more elusive. In general, validity may be defined as the extent to which a test measures what it purports to measure. Thus, while reliability concerns estimating the amount of variance in a test which is systematic variance, validity focusses on the amount of test variance which is meaningful construct-relevant variance. Alternatively, test invalidity may be defined as the presence of systematic, unwanted variance (Carmines & Zeller, 1979).

It is customary to classify validity into three categories: content validity, criterion validity and construct validity. However, in light of the limited usefulness of content and criterion validity for assessing social scientific measures (Carmines & Zeller, 1979), the present discussion will be restricted to an examination of construct validity. (All three types of validity are discussed in relation to self-esteem by Wells & Marwell, 1976). At its most general level, construct validity involves establishing the correspondence between the observable properties of a test and the theoretical model underlying the test. Thus, construct validation begins with the formulation of a theoretical model describing the properties of the construct, its relationships with other constructs and their properties. This model leads to testable predictions. If the predictions are sustained on the basis of empirical evidence

(i.e. if the model is consistent with the observed data) then belief in the validity of the construct is increased (Carmines & Zeller, 1979).

It is possible to distinguish between the internal construct validity of a test and its external construct validity (Wells & Marwell, 1976). Internal validity concerns the extent to which the internal structure of the test is consistent with the hypothetical structure of the construct. Using factor analytic methods for example, internal validity is assumed if the factorial structure of the test is consistent with the hypothesised structure of the construct. Internal construct validity also involves considering possible alternative explanations of subjects' response patterns. It is important to determine whether between subject variations on the measure reflect variations on the construct, or whether they reflect other factors, such as response biases arising from the effects of social desirability, acquiescence or test format styles (Wells & Marwell, 1976).

External construct validity concerns the extent to which the hypothetical relationships between the construct and other variables of interest are supported by the empirical data. Popular methods for assessing external validity include the accumulation of correlational data, experimental data and the use of multimethod-multitrait procedures (Wells & Marwell, 1976). It will be shown later in this chapter (Chapter 1: 1.5) that it is possible to assess both the internal and external construct validity of a self-esteem

measure using confirmatory factor analytic techniques.

1.4 A MEASURE OF SELF-ESTEEM: THE SEI

This chapter has provided a broad introduction to the concept of self-esteem and an outline of some important problems associated with the measurement of hypothetical, non observed constructs. These issues will now be considered in relation to a specific measure of self-esteem. The measure chosen for this study is the Coopersmith Self-Esteem Inventory (SEI) school form (Coopersmith, 1981).

The SEI was selected for a variety of reasons. Coopersmith's inventories "are among the best known and most widely used of the various self-esteem measures" (Peterson & Austin, 1985: 396), they are clear, brief, relatively easy to administer and score (Adair, 1984), and the school form was designed specifically for use with children aged from eight to fifteen years. Furthermore, "these measures are straight forwardly based on a general theory of self-esteem" (Peterson & Austin, 1985: 396) and they "may be used with the confidence that their development has been well thought out and researched from the beginning by a competent developmental psychologist" (Adair, 1984: 231). On the whole, there is an impressive body of literature to support the reliability and validity of these measures (Peterson & Austin, 1985).

The SEI school form is comprised of fifty items which measure self-esteem and an additional eight items to test for defensiveness.

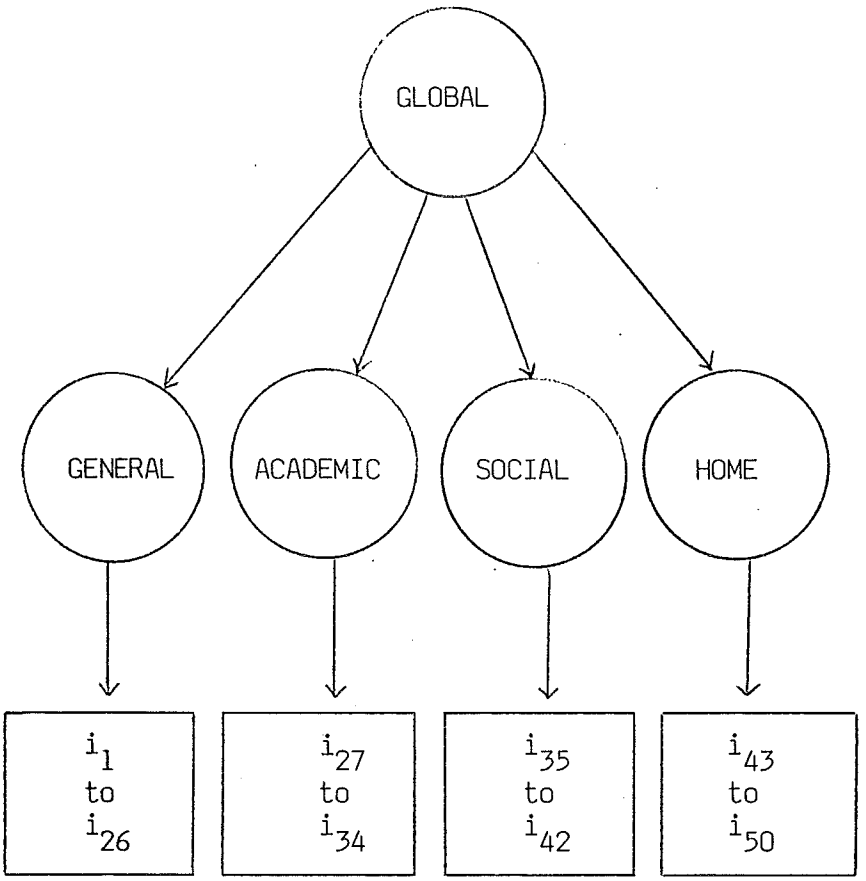
The items are short statements designed to reflect attitudes toward the self. Subjects respond by indicating whether the items are 'like me' or 'unlike me'. The self-esteem items may be summed to yield a total score which reflects overall or global self-esteem. Alternatively, separate scores may be computed to measure self-esteem in four areas of experience: general self; social self - peers; home - parents; and school - academic. The social, home and academic subscales are comprised of eight unique test items each. The remaining twenty-six self-esteem items make up the general subscale. (The format of the SEI, its subscales and scoring procedures are described in greater detail in Chapter 2: 2.3). The problems of assessing the structure of the SEI and its reliability and validity are addressed below.

(1) Theoretical Structure of the SEI

The method of scoring the SEI according to four content-specific subscales which are subsumed by a total score, implies that the underlying structure of the SEI conforms to an hierarchical model (Shavelson, Hubner & Stanton, 1976). This structure is shown in Figure 1.1. In this diagram the observed test items (i_1 to i_{50}) are indicators of four first order constructs reflecting self-esteem in specific content areas (General, Academic, Social and Home). In turn, the four specific self-esteem constructs are assumed to reflect a more general construct of total self-esteem (Global).

An important step toward establishing the internal validity of the SEI is to demonstrate that the structure of the observed item

FIGURE 1.1: Hierarchical Model of Self-Esteem



Notation:

Circles represent latent self-esteem constructs

Rectangles represent groups of SEI items (i) which measure each construct

scores conform to the hierarchical model. One way of testing this is through an exploratory factor analysis of the SEI items. Exploratory methods have been used in a number of studies (Roberson & Miller, 1986; Marsh & Smith, 1982; Kokenes, 1978; Edgar et al, 1974). With the exception of the Marsh & Smith study, these have produced results which may be interpreted as being consistent with the hierarchical model in Figure 1.1. However, exploratory factor modelling methods have a number of serious limitatations (Long, 1983a) which centre around the fact that the exploratory model is not based on substantively motivated considerations.

An alternative approach is to use methods of confirmatory factor analysis. For this approach the imposition of theoretically determined model constraints allows for a more direct test of the fit of the model to the data. A number of researchers have examined the structure of self-esteem using confirmatory factor models and a variety of self-esteem measures (Marsh et al, 1984; Marsh, Relich & Smith, 1983; Shavelson & Bolus, 1982). The results of these studies provide support for an hierarchical interpretation of self-esteem. A confirmatory factor model of the SEI was examined by Maruyama, Rubin & Kingsbury (1981). The model tested was similar to the model depicted in Figure 1.1 and the results suggested that the four self-esteem scales of the SEI, do in fact, reflect an underlying factor of global self-esteem.

(2) Reliability of the SEI

A number of studies have examined the reliability of the SEI.

The results of these studies are summarised in Table 1.1.. The split half and internal consistency coefficients reported ranged from 0.86 to 0.97. These coefficients suggest that the SEI has relatively high reliability. The four SEI subscales had split half and internal consistency coefficients ranging from 0.37 to 0.77. The highest coefficients were consistently obtained on the General Scale which is only to be expected since this scale contains more items (n_i = 26) than the other self-esteem scales (n_i = 8 each).

A number of studies also computed test-retest reliabilities for the SEI. These coefficients ranged from 0.42 for a three year retest period to 0.88 for a five week retest period. Lower retest reliabilities were obtained for longer retest time intervals. This may be attributed to the reliability estimates being confounded by stability factors (Guilford & Fruchter, 1973; Heise, 1969). The retest coefficients for short time intervals were generally of the same magnitude as the split half and internal consistency coefficients.

The overall impression conveyed by the results in Table 1.1 is that the SEI has proved to have very good reliability.

(3) Relationship of the SEI to External Measures

While tests of reliability and factorial studies provide insights into the likely properties of self-esteem, an important feature of any construct is its relationships with other theoretically linked constructs. Empirical evidence of the relationships between the SEI and other measures provides data for assessing the external

Table 1.1: Studies Citing Reliability Data for the SEI.

Study	Sample Characteristics N	Age (years)	Sex (M/F)	Other	Reliability Test	Total	SEI Measure General	Academic	Social	Home
Johnson et al, 1983	105	10	M+F		α	.86	.71	.61	.61	.61
Cowan, Altmann & Pysh, 1978	175	8-11	M+F		KR21	.97				
Rubin, 1978	191	9	M+F		Retest	.42	.31	.36	.35	.24
	189	12	M+F		(3 years)	.64	.55	.55	.50	.34
Battle, 1977	198	8-11			Alternate Forms	.71-.80				
*Zirkel & Gable, 1977	218	12-13	M+F	Total	Retest (3 weeks)	.76				
	45			Black		.86				
	132			Puerto Rican		.74				
	41			White		.72				
Edgar et al, 1974	816	12-14	M+F	Australian sample	α	.87	.78	.58	.63	.74
	107	13-14	M+F	Australian sample	α	.86	.79	.54	.74	.72
Spatz & Johnson, 1973	300	10,14,17			KR20	>.80				
Fullerton, 1972 (Cited in Coopersmith, 1981)	104	9-10			Split half	.87				
					Retest (1 year)	.70				

Table 1.1: Continued

Study	Sample Characteristics N	Age (years)	Sex (M/F)	Other	Reliability Test	SEI Measure Total	General	Academic	Social	Home
Kimball, 1972	1502	9	M+F	Black &	KR20	.92				
(Cited in	1407	10		Spanish surnamed		.87				
Coopersmith,	1650	11				.88				
1981)	1539	12				.89				
	1495	13				.90				
Nicholls, 1967	77	13	M	New Zealand sample	Split half		.77	.67	.36	.71
	76		F				.64	.53	.39	.56
Taylor & Reitz, 1968 (Cited in Coopersmith, 1981)					Split half	.90				
					Retest (5 weeks)	.88				
					(3 years)	.70				

* denotes modified version of SEI used.

validity of the measure. There have been numerous studies which have examined the SEI in relation to external variables. A summary of the literature in this area is presented in Table 1.2. This table is not an exhaustive account of the research conducted with the SEI. Rather, it aims to present a representative sample of the research which is relevant to the present study. The implications of this research are discussed below.

(a) Gender. The results in Table 1.2 provide strong evidence that SEI scores are not affected by subject's gender. In the studies examined no significant gender differences were found for mean SEI scores. These results are consistent with studies which have examined other measures of self-esteem. Wylie notes that "the evidence from studies involving well-known instruments fails to support a relationship between sex and overall self-regard" (1979: 273).

(b) Age. Table 1.2 shows that the findings on the relationship between SEI scores and age are inconsistent. These studies found that SEI scores increased with age, decreased with age, or remained unaffected by age. Generally, any differences that were reported, tended to be small. In a summary of self-esteem studies, Fleming & Courtney note that:

> Age has been shown to be positively correlated with self-esteem .... though in other studies age has been either unrelated or negatively related .... The relation .... depends in part, no doubt, on the age range under consideration. (1984: 410)

(c) Ethnicity. While some of the studies in Table 1.2 report ethnic differences on mean SEI scores, the overall impression is that

Table 1.2: Studies Providing Data on the Relationships of SEI Measures to External Variables

Study	Sample Characteristics N	Age (years)	Other	Other Measures	Type of Analysis	Results & Comments (SE = Self-Esteem)
a) GENDER						M = Male; F = Female
Coopersmith, 1981	87	10-11			Mean Scores	$\bar{x}_M = 81.3$; $\bar{x}_F = 83.3$: NS
	1748	Not given				$\bar{x}_M = 70.1$; $\bar{x}_F = 72.2$: NS
Smith, 1978	305	9-11	Australian		Mean Scores by age	M: $\bar{x}_9 = 73.4$; $\bar{x}_{10} = 74.9$; $\bar{x}_{11} = 70.5$ F: $\bar{x}_9 = 74.1$; $\bar{x}_{10} = 76.7$; $\bar{x}_{11} = 73.9$: NS
Drummond, McIntire & Ryan, 1977	591	7-17			Mean Scores by age	NS
Simon & Simon, 1975	87	10-12			Mean Scores	$\bar{x}_M = 70.8$; $\bar{x}_F = 69.6$: NS
Donaldson, 1974 (Cited in Coopersmith, 1981)	643	8-13			Mean Scores	$\bar{x}_M = 64.8$; $\bar{x}_F = 63.5$: NS
Edgar et al, 1974	816	12-14	Australian		Correlation	NS
Primavera, Simon & Primavera, 1974		10-11	Catholic		Mean Scores	$\bar{x}_M = 69.3$; $\bar{x}_F = 70.8$: NS

Table 1.2: Continued

Study	Sample Characteristics N	Age (years)	Other	Other Measures	Type of Analysis	Results & Comments (SE = Self-Esteem)
Reed, 1972 (Cited in Coopersmith, 1981)	153	7,8,9,10	Mid-Low SES		Mean Scores	$\bar{x}_M = 57.0$; $\bar{x}_F = 62.8$
Trowbridge, 1972	3789	8-13			Mean Scores	$\bar{x}_M = 70.8$; $\bar{x}_F = 70.9$: NS
Simon & Bernstein, 1971	129	11-12	Surburban		Mean Scores	$\bar{x}_M = 70.4$; $\bar{x}_F = 69.6$: NS
b) AGE						
Demo & Savin-Williams, 1983	830	10-13			Mean Scores	Small increases with age ($p<.01$)
Smith, 1978	305	9-11			Mean Scores (by gender)	9: $\bar{x}_M = 73.4$; $\bar{x}_F = 74.1$ 10: $\bar{x}_M = 74.9$; $\bar{x}_F = 76.9$ 11: $\bar{x}_M = 70.5$; $\bar{x}_F = 73.9$
					ANOVA	No consistent age differences No interaction effects
Donaldson, 1974 (Cited in Coopersmith, 1981)	643	8-13			Mean Scores	$\bar{x}_8 = 57.1$; $\bar{x}_{13} = 66.9$ Small consistent increases with age.
Reed, 1972 (Cited in Coopersmith, 1981)	153	7,8,10	Mid-Low SES		Mean Scores	$\bar{x}_7 = 60.5$; $\bar{x}_8 = 61.3$; $\bar{x}_{10} = 58.1$: Inconsistent. NS

Table 1.2: Continued

Study	Sample Characteristics N	Age (years)	Other	Other Measures	Type of Analysis	Results & Comments (SE = Self-Esteem)
Trowbridge, 1972	3789	8-13			Mean Scores	$\bar{x}_8 = 72.5$; $\bar{x}_{13} = 68.5$: NS Small consistent decreases with age
Ketcham & Morse, 1965 (Cited in Coopersmith, 1981)	484	8-16			Mean Scores	$\bar{x}_8 = 60.4$; $\bar{x}_{10} = 54.0$; $\bar{x}_{12} = 55.8$; $\bar{x}_{14} = 56.7$; $\bar{x}_{16} = 59.1$ Significant drop at 10 steady increase after this
c) ETHNICITY						
*Ranby, 1979			Maori (M) & Pakeha (P)	Also used Semantic Differential Inventory to measure self-esteem	Mean Scores ANOVA	$\bar{x}_M < \bar{x}_P$; persisted when age, gender, SES and other factors taken into account
*Zirkel & Gable, 1977	45	13	Black (B)		Mean Scores on two testings	$\bar{x}_{B1} = 25.1$; $\bar{x}_{B2} = 26.9$
	132		Puerto Rican (PR)			$\bar{x}_{PR1} = 26.9$; $\bar{x}_{PR2} = 27.9$
	41		White (W)			$\bar{x}_{W1} = 29.2$; $\bar{x}_{W2} = 31.1$ Significant differences

Table 1.2: Continued

Study	Sample Characteristics N	Age (years)	Other	Other Measures	Type of Analysis	Results & Comments (SE = Self-Esteem)
Donaldson, 1974 (Cited in Coopersmith, 1981)	319	8-13	Hispanic (H)		Mean Scores	$\bar{x}_H = 63.6$; $\bar{x}_B = 64.6$;
	60		Black (B)			$\bar{x}_W = 63.8$
	243		White (W)			No meaningful differences
*Williams, 1973	133	5	Anglo & Hispanic		Correlation	No relationship. Data not given
Reed, 1972 (Cited in Coopersmith, 1981)	137	7,8,10	White (W)		Mean Scores	$\bar{x}_W = 60.3$; $\bar{x}_N = 56.4$
	16		Non-white (N)			
Trowbridge, 1972	681	8-13	Black (B)		Mean Scores	$\bar{x}_B = 73.6$; $\bar{x}_O = 70.0$: $p<.01$
	3108		Other (O)		ANOVA	Effects persist when SES & urban/rural area taken into account. No interaction effects.
d) SOCIO-ECONOMIC STATUS (SES)						
Demo & Savin-Williams, 1983	830	10-13		Paternal Occupation	Gamma χ^2	Positive association with SES stronger for older children
Maruyama, Rubin & Kingsbury, 1981		9-15		From parental occupation, income and education	Confirmatory Factor Analysis	SES has a positive causal influence on SE

Table 1.2: Continued

Study	Sample Characteristics N	Age (years)	Other	Other Measures	Type of Analysis	Results & Comments (SE = Self-Esteem)
Rubin, Dorle & Sandidge, 1977	530	12		From parental occupation, income and education	Correlation	r = .19. Data unclear - presumably indicates a positive relationship with SES.
Reed, 1972 (Cited in Coopersmith, 1981)	22	7,8,10	Low SES (L)		Mean Scores	$\bar{x}_L = 61.7$; $\bar{x}_M = 59.8$.
	133		Mid SES (M)			Low SES have slightly higher SE.
Trowbridge, 1972	1662	8-13	Low SES (L)		Mean Scores	$\bar{x}_L = 74.1$; $\bar{x}_M = 68.4$: $p<.01$
	2127		Mid SES (M)		ANOVA	Low SES have higher SE: effects persist when race & rural/urban area taken into account. No interaction effects. Not confounded by IQ. Is confounded by achievement.
Coopersmith, 1967	80	10-12	Males	From paternal income and occupation	χ^2	$\chi^2 = 6.60$, df = 4, NS
e) FAMILY BREAKDOWN						
Smiley, Chamberlain and Dalgleish, 1983	16	7-11	1 year separation (1)		Mean Scores	$\bar{x}_1 = 74.25$; $\bar{x}_2 = 77.15$;
	19		2-3 year separation (2)			$\bar{x}_3 = 74.00$:
	26		Intact family (3)			NS

Table 1.2: Continued

Study	Sample Characteristics N	Age (years)	Other	Other Measures	Type of Analysis	Results & Comments (SE = Self-Esteem)
Coopersmith, 1967	80	10-12	Males	Incidence of previous marriages	χ^2	$\chi^2 = 5.40$; df = 2; $p<.07$ Mothers of low SE boys had a greater incidence of previous marriages
f) ACADEMIC ACHIEVEMENT						
*Gibbs & Norwich, 1985	41	13-16	School non-attenders	Word Recognition (WR)	Correlation	$r_{WR} = .18$
	41		Matched school attenders			
Johnson et al, 1983	105	10		Iowa Test of Basic Skills	Multiple regression	Positive association with school achievement
Demo & Savin-Williams, 1983	830	10-13		Iowa Test of Basic Skills	ANOVA	$\chi^2 = 36.1$, df = 2, $p<.001$ Clear positive association with academic skills
Maruyama, Rubin & Kingsbury, 1981		9-15		Stanford & wide range tests	Confirmatory Factor Analysis	SE and achievement are both determined by IQ and social class. No causal relationship.
Rubin, 1978	191	9	Retest 12 years	2 x Stanford Achievement Tests (SRA)	Correlation	$r_9 = .22$; $r_{12} = .30$; $r_{15} = .41$ 1. Positive association with achievement. 2. This increases with age. 3. Sex differences: stronger association for girls at a younger age.
	189	12	Retest 15 years			

Table 1.2: Continued

Study	Sample Characteristics N	Age (years)	Other	Other Measures	Type of Analysis	Results & Comments (SE = Self-Esteem)
Rosenberg & Gaier, 1977	23 47	12-15	Learning disabled Males (LD) Matched average students		MANOVA	LD have lower social SE. No difference on other subscales of SEI.
Rubin, Dorle & Sandidge, 1977	530	12		2 x SRA 3 x Wide Range Tests 3 x Teacher Ratings	Correlations Multiple Regression	r range: .22 - .34. SES & IQ are better predictors of achievement than SE. SE has no strong independent effect.
Simon & Simon, 1975	87	10-12		5 x SRA Tests	Correlation	r = .33. No sex differences
Edgar et al, 1974	107	13-14	Australian	Aggregate School Mark	Correlation	r range .14 - .35 subscales r = .35 for Total SE.
Primavera, Simon & Primavera, 1974		10-11	Catholic	5 x SRA Tests	Correlation	Sex differences: SE more strongly related to achievement for girls than boys
*Williams, 1973	133	5		Reading Achievement and Readiness	Correlation	No association with reading achievement or readiness. No data given.
Trowbridge, 1972	1662 2127	8-13	Low SES Mid SES	Iowa Test Reading Age	Correlation ANOVA	Clear association between SE and achievement is confounded by SES.
Coopersmith, 1967	69	10-12	Boys	Grade Point Average	Correlation	$r = +.30$, $p<.05$

Table 1.2: Continued

Study	Sample Characteristics N	Age (years)	Other	Other Measures	Type of Analysis	Results & Comments (SE = Self-Esteem)
Nicholls, 1967	153	13	New Zealand	Reading Test	Correlation	SE positively associated with reading
g) INTELLIGENCE						
*Gibbs & Norwich, 1985	68	13-16		WISC-R (Verbal)	Correlation	r = .03. No association with verbal IQ
Maruyama, Rubin & Kingsbury, 1981		9-15		WISC	Confirmatory Factor Analysis	IQ & Social class causally influence SE
Rubin, Dorle & Sandidge, 1977	530	12		WISC	Correlation	r = .31 with full scale IQ
Simon & Simon, 1975	87	10-12		Lorge Thorndike IQ Test	Correlation	r = .30 Verbal IQ r = .23 Non-verbal IQ
*Williams, 1973	133	5		Kuhlmann-Anderson Test	Correlation	No relationship Data not given
Coopersmith, 1967	84	10-12	Boys	WISC	Correlation	r = .28, $p<.05$
Nicholls, 1967	153	13	New Zealand	PMA	Correlation	Positive association with IQ
h) PERSONALITY						
Kawash & Clewes, 1986	206	9-12		Children's Personality Questionnaire (CPQ)	Correlation	Anxiety traits r range -.50 to -.75 High degree of shared variance with CPQ. Concludes that there is considerable overlap between SE and established personality traits

Table 1.2: Continued

Study	Sample Characteristics N	Age (years)	Other	Other Measures	Type of Analysis	Results & Comments (SE = Self-Esteem)
Kawash, 1982		Mixed ages		16PF, HSPQ, CPQ	Correlation	Anxiety traits most highly related to SE. Some extra-version measures also related. Similar across age and gender.
Cowan, Altmann & Pysh, 1978	175	8-11		Child Manifest Anxiety Scale	Correlation	r = -.73. This is higher than SEI correlations with 3 other SE measures. Questions discriminant validity of SEI.
Smith, 1978	305	9-11	Australian	Trait Anxiety (STAIC)	Correlation Factor Analysis	r not given. Suggest >-.46. High positive SE and negative anxiety loadings on 1 factor Details not given.
Edgar et al, 1974	82 62	12-14	High SEI scores Low SEI scores	General Anxiety	Correlation	High SEI r = -.23; Low SEI r = -.41. Anxiety associated with low SE
Taylor & Reitz, 1968 (Cited in Coopersmith, 1981)				CPI	Correlation	r = .45 for self acceptance. Other scales r = .42 & .66. Questions divergent validity of SEI
Coopersmith, 1967	83	10-12	Boys	Taylor Manifest Anxiety Scale	Correlation	r = -.67

Table 1.2: Continued

Study	Sample Characteristics N	Age (years)	Other	Other Measures	Type of Analysis	Results & Comments (SE = Self-Esteem)
Nicholls, 1967	153	13	New Zealand	General Anxiety, Test Anxiety, Defensiveness, Lie Scale	Correlation	SEI subscale r_{GEN} range -.02 to -.44; r_{TEST} range -.25 to -.53. Small positive association with defensiveness and Lie Scales.
i) SOCIAL DESIRABILITY						
Johnson et al, 1983	105	10		Crandall's Social Desirability Scale (SDS).	Correlation	r = .17. Supports discriminant validity of SEI.
Cowan, Altmann & Pysh, 1978	175	8-11		Crandall's SDS	Correlation	Sex differences: r_M = .23; r_F = .52 Questions discriminant validity for girls
Taylor & Reitz, 1968 (Cited in Crandall, 1973)				Edwards SDS Marlowe-Crowne SDS	Correlation	r_E = .75; r_{MC} = .44.
j) OTHER SELF MEASURES						
*Chiu, 1985	47	9		Behaviour Rating Form (BRF)	Correlation	r_9 = .58; r_{11} = .48
	17	11				

Table 1.2: Continued

Study	Sample Characteristics N	Age (years)	Other	Other Measures	Type of Analysis	Results & Comments (SE = Self-Esteem)
Demo, 1985	55	14-15		2 x Self-report 3 x Observer Rating Scales	Correlation	Strong evidence of convergent validity. SEI significantly related to all measures except observer check list.
*Gibbs & Norwich, 1985	41	13-16	School non-attenders	Self-Peers Ranking Grid	Correlation	r = .53
	41		Matched attenders			
Johnson et al, 1983	105	10		Behavioural Academic SE (BASE), Piers-Harris (PH)	Multiple Regression	r_{BASE} = .47; r_{PH} = .63 Evidence to support convergent validity
Cowan, Altmann & Pysh, 1978	175	8-11		Bledslow (B) P.H. Perdue (P) BRF	Correlation	r_B = .31; r_{PH} = .75; r_P = .39; r_{BRF} = .05. Significant r with all except the BRF.
Smith, 1978	305	9-11	Australian	Sears	Correlation	r = .46
*Zirkel & Gable, 1977	218	13		Primary (PR) Social Self Symbols Task (SS) Teacher Rating Scale (TRS) BRF	Correlation	r_{PR} = .37; r_{SS} = .03; r_{BRF} = .13, r_{TRS} = .14.

Table 1.2: Continued

Study	Sample Characteristics N	Age (years)	Other	Other Measures	Type of Analysis	Results & Comments (SE = Self-Esteem)
Edgar et al, 1974	816	12-14	Australian	BRF	Correlation	SEI subscales r range .13 to .24. Total SEI r = .25. Weak relationship.
	107	13-14	Australian	Self-Acceptance	Correlation	SEI subscales r range .04 to .22. Total SEI r = .21. Weak relationship
Fullerton, 1972 (Cited in Coopersmith, 1981)	104	10-11	IQ > 130	BRF	Correlation	r = .44

such differences are small and inconsistent. There is no strong evidence to support the theory that ethnic minority children have low self-esteem, and the data suggest that for some samples, black children report higher self-esteem than white children.

Unfortunately only one SEI study was located which reported ethnic data for New Zealand children. Using a modified form of the SEI in conjunction with the Semantic Differential Inventory to measure self-esteem, Ranby (1979) concluded that Maori children have a lower mean self-concept than Pakeha children. This difference persisted when the effects of age, gender, SES, achievement and other factors were taken into consideration. However, Ranby's study has been strongly criticised for poor methodology and for confusing statistical significance with meaningful differences (Chapman, 1984). In an attempt to clarify the matter, Chapman examined ethnic differences in a sample of 1096 eleven year old children ($n_{Maori} = 94$). Using the SPAS, a measure of academic achievement, Chapman found no differences between Maori and Pakeha children on self-concept scores.

(d) Socio-Economic Status. The popular belief that children from disadvantaged backgrounds have relatively low self-esteem (Wells & Marwell, 1976) suggests that measures of self-esteem should be positively related to a child's socio-economic status (SES). However, the overall evidence from SEI studies is inconclusive. The studies in Table 1.2 found that the SEI was either positively related to SES, negatively related to SES, or not related to SES. Demo & Savin-Williams (1983) suggest that the age of the children examined

may account for some of this discrepancy. The authors speculate that with increasing age, SES becomes more meaningful to children and thus, more consequential for their levels of self-esteem. However, in her review of self-esteem studies in general, Wylie concludes:

> The alleged positive association of socio-economic level and overall self-regard is not supported by available investigations involving the better known tests and modifications thereof. (1979: 93)

(e) Family Breakdown. Coopersmith (1967) examined the family background of a sample of boys in relation to their self-esteem. He concluded that the mothers of low self-esteem boys had a greater incidence of previous marriages than the mothers of high self-esteem boys. In contrast, in a more recent study, Smiley, Chamberlain & Dalgleish (1983) found that children from intact families did not differ from children with separated parents in their levels of self-esteem. Both of these studies are based on relatively small samples and it is not possible to determine from these results whether self-esteem is related to a history of family breakdown.

(f) Academic Achievement. It is a widely held belief that self-esteem has an important association with academic achievement. This is illustrated by Coopersmith's introductory paragraph to the SEI manual:

> With increasing frequency, parent and student complaints are heard about lack of motivation and non-involvement in learning and about student disinterest with what occurs during school hours. Absentee rates are climbing markedly, and disciplinary and drug problems are becoming increasing sources of parent and teacher concern. Positive feelings about oneself appear to be one of the feeling states that

> increase involvement and successful performance. As such, building self-esteem is not a second, luxury option in the schools' programs, but is more of a basic component of programs geared to motivate learning. (1981: 1)

Interest in the esteem-achievement relationship has generated a great deal of research. In a review of the literature, Hansford & Hattie suggest:

> Although some researchers convey the impression that a moderate and positive association exists between self and measures of performance and achievement, an initial and cursory assessment of the literature suggests that this relationship is neither precise nor clear. In fact, given the volume and diversity of research literature it is possible to find support for all viewpoints. (1982: 124)

Nonetheless, the studies in Table 1.2 provide clear evidence to support a positive esteem-achievement relationship, with correlation coefficients ranging from 0.22 to 0.45. Discrepant results were reported by Gibbs & Norwich (1985) and Williams (1973) who used the short form or a modified form of the SEI to measure self-esteem.

The importance of the esteem-achievement relationship has led to several lines of research. A number of researchers have examined the possible confounding effects of socio-demographic and other factors on the relationship. Some studies using the SEI have found that this association is modified by factors such as gender and SES (Rubin, 1978; Primavera, Simon & Primavera, 1974; Trowbridge, 1972). Studies using other measures have suggested that age, ethnicity, socio-economic status and cognitive ability may also have an influence (see Hansford & Hattie (1982); Wylie (1979) for a review).

A second concern has been the direction of causality. While a number of theorists including Coopersmith, have opined that self-esteem influences achievement, the general consensus of the research favours the view that self-esteem is a consequence of achievement rather than a cause of achievement. For example, Schierer & Kraut in a review of educational intervention programs conclude:

> ... the overwhelming negative evidence reviewed here for a causal connection between self-concept and academic achievement should create caution among both educators and theorists who have heretofore assumed that enhancing a person's feelings about himself would lead to academic achievement. (1979: 145)

Some recent studies which have tested causal models of the esteem-achievement relationship (Byrne, 1986; Newman, 1984; Harter & Connell, 1982; Calsyn & Kenny, 1977) have provided further evidence to support the esteem-as-a-consequence theory. However, some authors have found support for the opposing esteem-as-a-cause view. For example, the results of longitudinal analyses by Marsh (1987) and Shavelson & Bolus (1982) suggest that self-esteem is 'causally predominent' over achievement.

A third line of research has focussed on the specificity of the association between self-esteem and achievement: whether achievement influences specific dimensions of self-esteem, or whether it has more general and pervasive effects on the self-concept. In a review of studies using a variety of self-esteem measures, West, Fish & Stevens (1980) conclude that the overall evidence supports the theory that measures of academic self-esteem are more highly related to achievement than measures of general or global self-esteem.

(g) Intelligence. It is clear from Table 1.2 that SEI scores are positively related to measures of intelligence. The reported correlations range from 0.23 to 0.31. Notably, discrepant results were again reported by Gibbs & Norwich (1985) and Williams (1973). This suggests that the results from studies using short or modified forms of the SEI should be interpretted with caution.

(h) Personality. A number of studies have examined the relationship between SEI scores and broad measures of personality. In general, the results indicate that SEI scores are highly correlated with personality measures, and specifically with anxiety-related traits. The clear, consistent patterns found by Kawash & Clewes (1986) led these authors to suggest that "a child's level of self-esteem can be inferred from his/her CPQ profile" (p. 216). They conclude that children with high self-esteem are emotionally mature, realistic, extroverted, placid, relaxed, secure and tolerant.

Several studies have examined self-esteem and measures of anxiety. Reported correlations with total SEI scores ranged from moderate (-0.23) to high (-0.73). These results have led some authors to question the divergent validity of the SEI. For example, Cowan, Altmann & Pysh (1978) found that the SEI was more highly correlated with anxiety than with three of the four other measures of self-esteem that they examined. These authors conclude that "some self-concept scales measure the same trait, adjustment, in common with the anxiety scale" (p 219).

(i) Social Desirability. The results in Table 1.2 suggest that SEI scores are positively related to measures of social

desirability. However, the magnitude of this relationship remains unclear. SEI correlation coefficients ranged from 0.17 with the Crandall scale to 0.75 with the Edwards scale. It is likely that the analysis using the Edwards scale has overestimated the true social desirability correlation, since this instrument has been widely criticised for confounding social desirability with psychological adjustment (Crandall, 1973).

(j) Other Self-Esteem Measures. The SEI has been examined in relation to a variety of other measures of self-esteem. Significant positive correlations have been reported ranging from 0.31 to 0.75 for other well-known, established measures. It is evident that large variations have been found for correlations between the SEI and Coopersmith's Behaviour Rating Form (BRF), a teacher-rating measure of child self-esteem. However, the BRF has been shown to be poorly related to other self-report measures of self-esteem (Cowan, Altmann & Pysh, 1978; Zirkel & Gable, 1977) and the inconsistencies are likely to reflect poor validity on the part of the BRF, rather than on the part of the SEI. It may be concluded that the significant correlations between the SEI and other self-report measures provide strong evidence of convergent validity (Demo, 1985).

The review presented above suggests generally consistent tendencies for SEI measures to be related to a wide range of social, cognitive and behavioural measures. These findings do not conclusively establish the construct validity of the SEI. However, they do suggest that whatever is measured by the SEI reflects a relatively

enduring attribute of the individual which has pervasive associations with a wide range of measures relating to ability, achievement, adjustment and possibly social background. This evidence clearly establishes the need for developing and testing a theoretical model which takes account of the structure and content of the SEI and the ways in which this measure is related to aspects of individual functioning.

1.5 HIERARCHICAL FACTOR MODEL OF SELF-ESTEEM

The above discussions suggest that there are two major issues to be confronted in establishing the reliability and validity of the SEI. The first issue concerns analysing the internal structure of the SEI, linking test scores to the conceptual model which allegedly underlies it, and the second issue concerns analysing the relationships between the SEI and a number of external validating variables. The present section develops the relevant theoretical/statistical background for examining these issues. A confirmatory factor model will be developed which describes the hypothesised structure of the SEI and its relationships with external variables in terms of a system of solvable simultaneous linear equations.

(1) The Internal Structure of the SEI

It was noted earlier that the structure of the SEI may conform to an hierarchical model in which:

(i) The observed test items are indicators of four first order factors of specific self-esteem. These factors reflect self-esteem in the general, academic, social and home areas of experience.

(ii) In turn, the first order factors are indicators of a more general second order factor, global self-esteem.

This model has been presented in Figure 1.1. There are two problems with the model. The first problem is the estimation of the effects of random errors of measurement. This involves estimating the component of variance in the observed test items which reflect test unreliability. The second problem involves structuring the test scores corrected for reliability, according to the higher order factor of global self-esteem. These problems will be dealt with in turn.

(a) Estimation of Random Errors. Coopersmith (1981) suggests that it is possible to estimate specific self-esteem by adding the item scores obtained on each SEI subscale. However, this method fails to take account of the effects of random errors of measurement. An alternative approach is to estimate test reliability using linear equations.

To take account of the effects of unreliability on the specific areas of self-esteem it is convenient to use multiple indicators. For simplicity, assume that during the SEI administration two measures of each subscale were obtained. One way of achieving this is to partition the four subscale item sets into split halves, thus forming two indicator variables for each subscale. Let y_i denote the ith (i = 1 to 8) indicator variable. The relationship between the observed split half indicators and the underlying non observed specific self-esteem factors is given by the equation:

$$y_i = \lambda_{yi} \eta_j + \epsilon_i$$

where η_j denotes the non observed true score of the jth (j = 1,2,3,4) subscale and ε_i denotes random errors of measurement. The coefficients λ_{yi} describe the regression of y_i on the true score specific self-esteem factor η_j. The structure described by this equation is known as a true score model. The model makes three assumptions:

(i) the indicator variables y_i are scaled to have a mean of zero

(ii) the disturbance terms ε_i are uncorrelated with each other

(iii) the ε_is are uncorrelated with the true score factor η_j.

For the case in which i = 1 to 8; j = 1,2,3,4 this model may be expressed in matrix notation as follows:

$$\underset{\sim}{y} = \underset{\sim}{\Lambda y}\,\underset{\sim}{\eta} + \underset{\sim}{\varepsilon}$$

$$\begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \\ y_5 \\ y_6 \\ y_7 \\ y_8 \end{bmatrix} = \begin{bmatrix} \lambda y_1 & 0 & 0 & 0 \\ \lambda y_2 & 0 & 0 & 0 \\ 0 & \lambda y_3 & 0 & 0 \\ 0 & \lambda y_4 & 0 & 0 \\ 0 & 0 & \lambda y_5 & 0 \\ 0 & 0 & \lambda y_6 & 0 \\ 0 & 0 & 0 & \lambda y_7 \\ 0 & 0 & 0 & \lambda y_8 \end{bmatrix} \begin{bmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \\ \eta_4 \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \varepsilon_4 \\ \varepsilon_5 \\ \varepsilon_6 \\ \varepsilon_7 \\ \varepsilon_8 \end{bmatrix}$$

For the true score model, the variance/covariance matrix $\underset{\sim}{\Theta}_\varepsilon$ of the disturbance terms ε_i is diagonal; the matrix of covariances between the subscale true scores η_j and the disturbances ε_i is assumed to be

null; and the matrix of covariances $\underset{\sim}{\Theta}_{jk}$ between the constructs η_j, η_k is unrestricted. The scale of measurement of the η_j constructs may be set by assuming that these constructs are in standardised form with mean zero and variance one. (Alternatively, the metric of the η_js may be set by fixing to unity one of each pair of λ_{yi}s in the columns of $\underset{\sim}{\Lambda}_y$).

The structure implied by the true score model is shown in Figure 1.2. The model makes explicit the following:

(i) The observed split half indicators y_i are direct functions of two uncorrelated non observed variables: the latent subscale true scores η_j and the random errors of measurement ε_i. Consequently the variance of y_i is given by:

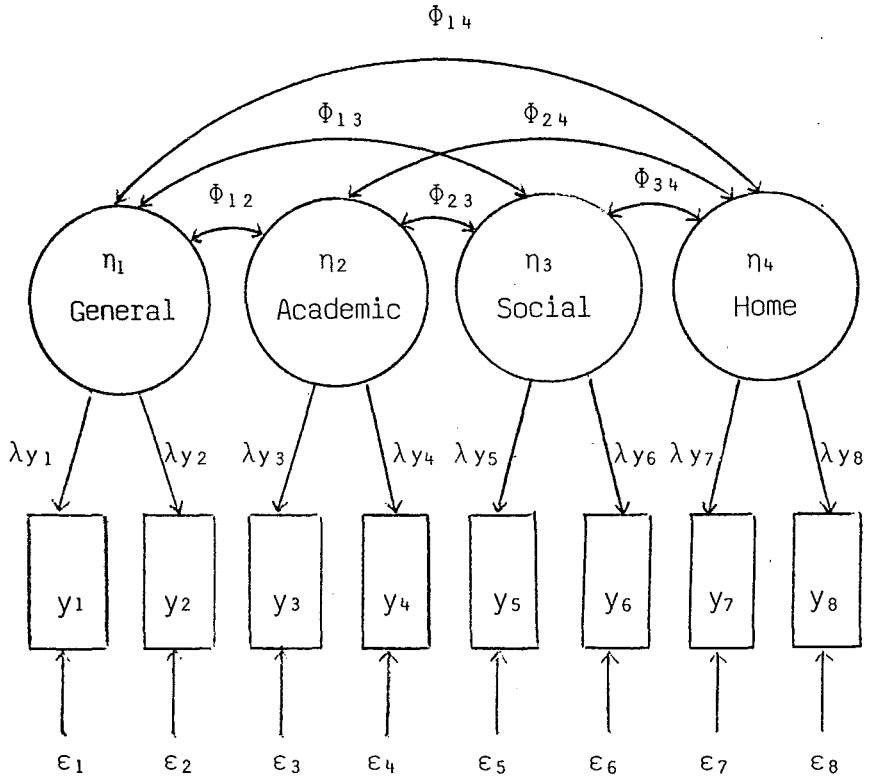
$$\begin{aligned} \text{Var}(y_i) &= E\,(\lambda_{yi}\eta_j + \varepsilon_i)^2 \\ &= \lambda_{yi}^2\text{Var}(\eta_j) + 2\lambda_{yi}\,\text{Cov}(\eta_j\varepsilon_i) + \text{Var}(\varepsilon_i) \\ &= \lambda_{yi}^2\text{Var}(\eta_j) + \text{Var}(\varepsilon_i) \end{aligned}$$

Clearly, the variance of y_i has two components: true score variance ($\lambda_{yi}^2\text{Var}(\eta_j)$) and variance attributable to random errors of measurement ($\text{Var}(\varepsilon_i)$).

(ii) By definition the reliability of a measure is the proportion of true test variance to observed variance. It follows that the reliabilities of the observed split half indicators are given by the equation:

$$r_{ttyi} = \frac{\lambda_{yi}^2\text{Var}(\eta_j)}{\text{Var}(y_i)}$$

FIGURE 1.2: True Score Model of Self-Esteem



Notation:

y_i = ith observed split half indicator

η_j = non observed true score of jth subscale

ε_i = random errors of measurement on ith indicator

λ_{yi} = regression coefficient linking y_i to η_j

Φ_{jk} = covariance of η_j, η_k.

and thus, for the standardised model in which Var (η_j) = Var (y_i) = 1, the reliability is:

$$r_{ttyi} = \lambda_{yi}^2$$

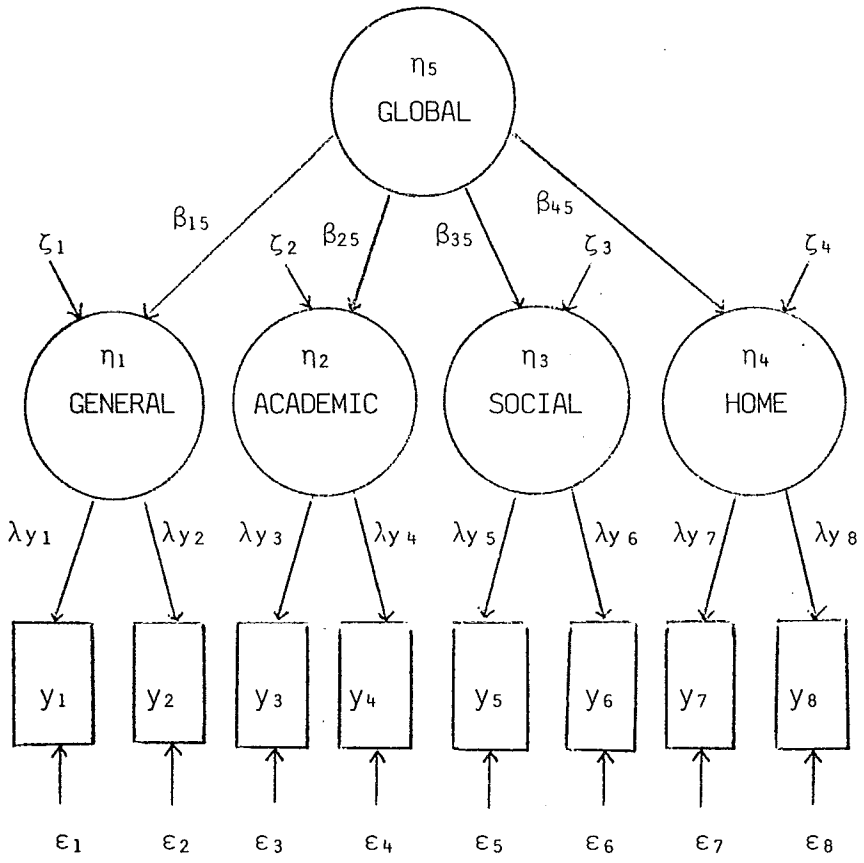
(iii) The coefficients Φ_{jk} are the covariances of the specific self-esteem constructs η_j, η_k. If the model is standardised, these coefficients are equal to the correlations between constructs. Equivalently, they may be regarded as the correlations between the subscale scores corrected for unreliability in the indicators. Thus it is possible using confirmatory factor modelling methods to estimate the reliability of the split half self-esteem indicators and to estimate the relationships between the SEI subscales corrected for reliability.

(b) The Hierarchical Structure. The measurement model in Figure 1.2 implies the presence of a number of correlations Φ_{jk} between the subscale true scores η_j, η_k. However it has been suggested that these correlations reflect the presence of a higher order factor of global self-esteem. The model incorporating global self-esteem (η_5) is shown in Figure 1.3. In this figure the correlations between the subscale true score variables (η_j, η_k) are accounted for by the higher order factor of global self-esteem (η_5). The structural relationship between the subscale true scores η_j (j = 1,2,3,4) and global self-esteem (η_5) may be described by the following equation:

$$\eta_j = \beta_{j5}\ \eta_5 + \zeta_j$$

where the coefficients β_{j5} describe the regression of η_j on the global self-esteem factor η_5. ζ_j denotes the disturbance term for

FIGURE 1.3: Higher Order Factor Model of Self-Esteem



Notation:

y_i = ith observed split half indicator

η_j = non observed true score of jth subscale (j = 1,2,3,4)

η_5 = higher order factor of global self-esteem

ε_i = random errors of measurement on ith indicator

ζ_j = disturbance term on η_j

λ_{yi} = regression coefficient linking y_i to η_j

β_{j5} = regression coefficient linking η_j to η_5

η_j. ζ_j may be regarded as the component of 'specificity' in η_j since it represents the proportion of systematic variance in η_j which is not accounted for by the higher order factor η_5. In addition to the assumptions made for the true score model of self-esteem, the higher order factor model presented in Figure 1.3 assumes that the disturbance terms ζ_j are uncorrelated with each other, and the ζ_j terms are uncorrelated with global self-esteem η_5.

In matrix notation the relationships between the specific self-esteem factors η_j (j = 1,2,3,4) and the global self-esteem factor (η_5) may be expressed as:

$$\underset{\sim}{\eta} = \underset{\sim}{\beta}\,\underset{\sim}{\eta} + \underset{\sim}{\zeta}$$

$$\begin{bmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \\ \eta_4 \\ \eta_5 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 & 0 & \beta_{15} \\ 0 & 0 & 0 & 0 & \beta_{25} \\ 0 & 0 & 0 & 0 & \beta_{35} \\ 0 & 0 & 0 & 0 & \beta_{45} \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \\ \eta_4 \\ \eta_5 \end{bmatrix} + \begin{bmatrix} \zeta_1 \\ \zeta_2 \\ \zeta_3 \\ \zeta_4 \\ 0 \end{bmatrix}$$

The variance/covariance matrix $\underset{\sim}{\psi}$ of the disturbance terms ζ_j is:

$$\underset{\sim}{\psi} = \begin{bmatrix} \psi_{11} & 0 & 0 & 0 & 0 \\ 0 & \psi_{22} & 0 & 0 & 0 \\ 0 & 0 & \psi_{33} & 0 & 0 \\ 0 & 0 & 0 & \psi_{44} & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

(2) Defensiveness and Systematic Measurement Error

While the model described above provides an account of the internal structure of the SEI, it fails to take account of sources of

systematic measurement error (invalidity) which may contaminate test scores. One possible source of invalidity may arise from defensiveness. In his development of the SEI, Coopersmith notes the possible contaminating effects of defensiveness, and he includes an eight item 'Lie Scale' in the SEI, which is designed to provide "a measure of a student's defensiveness or test wiseness" (1981: 2). However, while Coopersmith cautions that defensiveness may affect a subject's self-esteem score, he fails to describe the relationships between the defensiveness scale and the other subscales of the SEI. Peterson & Austin note that:

> detailed instructions are not provided about how to use the Lie Scale .... The user is told that high scores may indicate defensiveness, but we are left wondering just what is a 'high' score and what is the evidence linking such a score to defensiveness or to lying, behaviours with different denotations and connotations. (1985: 397)

Nonetheless, it is possible to take account of the possible contaminating effects of defensiveness. One approach is to incorporate the measure of defensiveness into the structure of the SEI by treating it as a source of systematic measurement error. For simplicity, assume that during the SEI administration two (split half) measures of defensiveness were obtained. Let y_i $(i = 9,10)$ denote the two indicators of the non observed construct of defensiveness η_6. It follows that the true score model of defensiveness may be expressed as:

$$y_i = \lambda_{yi}\, \eta_6 + \varepsilon_i \quad (i = 9,10)$$

where the coefficient λ_{yi} describes the regression of y_i on the true score defensiveness construct η_6, and ε_i denotes the random errors

of measurement. The assumptions which are made for the true score model of defensiveness are the same as those made for the true score model of self-esteem.

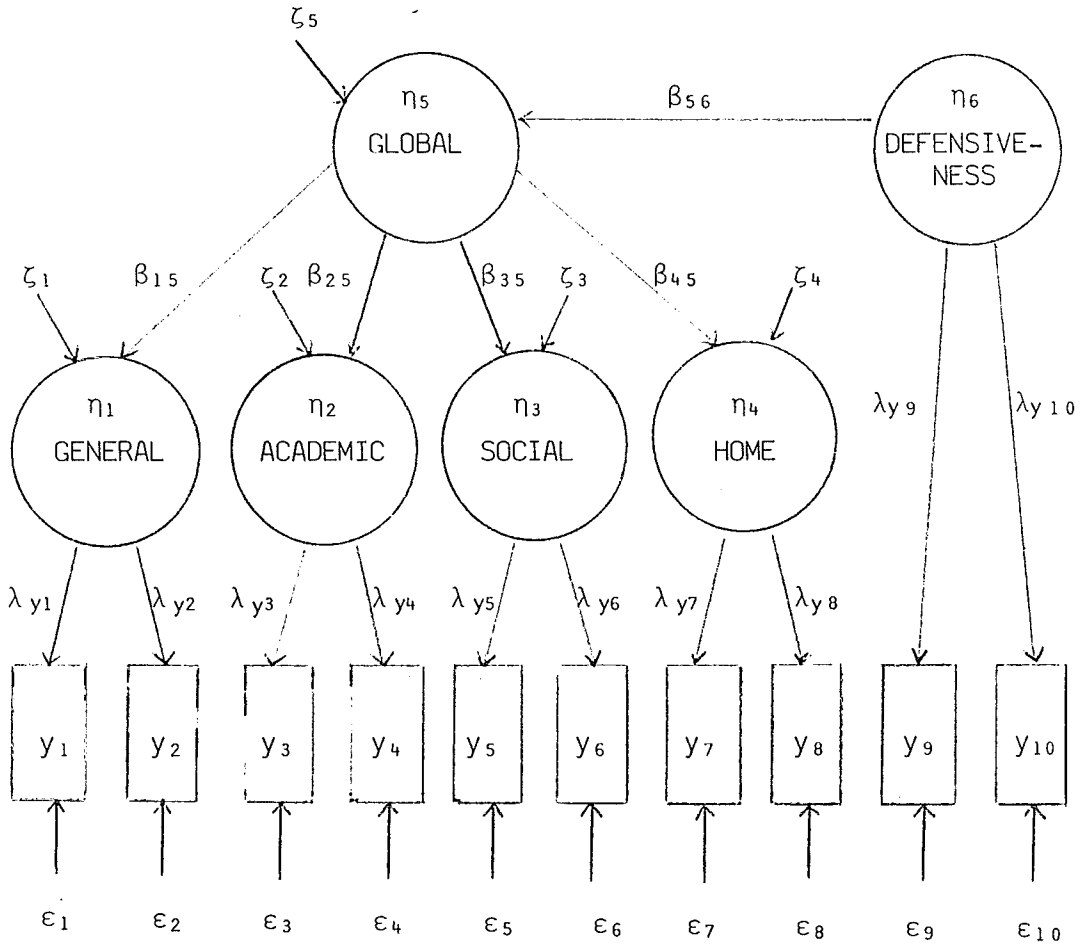
Defensiveness may be incorporated with the hierarchical model of self-esteem as shown in Figure 1.4. Clearly, defensiveness is not a dimension of self-esteem. Rather, it can be regarded as having a causal influence on a subject's overall reporting behaviour and thence causally influences the construct of global self-esteem η_5. That is, the global self-esteem construct η_5 is contaminated by a source of systematic error variance arising from variability in defensiveness η_6. The model in Figure 1.4 is comprised of two components: the measurement (true score) model and the structural equation (higher order factor) model. These may be expressed formally as follows:

(i) The measurement model is described by the equation:

$$y_i = \lambda_{yi}\, \eta_j + \varepsilon_i$$

where i = 1 to 10 and j = 1,2,3,4,6. In matrix notation this may be written as follows:

FIGURE 1.4: Higher Order Factor Model of Self-Esteem Incorporating Defensiveness.



Notation:

y_i = ith observed split half indicator

η_j = non observed true score of jth subscale (j = 1,2,3,4)

η_5 = higher order construct of global self-esteem

η_6 = non observed true score of defensiveness scale

ε_i = random errors of measurement on ith indicator

ζ_k = disturbance term on η_k (k = 1,2,3,4,5)

λ_{yi} = regression coefficient linking y_i to η_j

β_{j5} = regression coefficient linking η_j to η_5

β_{56} = regression coefficient linking η_5 to η_6

$$\underset{\sim}{y} = \underset{\sim}{\Lambda y}\ \underset{\sim}{\eta} + \underset{\sim}{\varepsilon}$$

$$\begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \\ y_5 \\ y_6 \\ y_7 \\ y_8 \\ y_9 \\ y_{10} \end{bmatrix} = \begin{bmatrix} \lambda y_1 & 0 & 0 & 0 & 0 & 0 \\ \lambda y_2 & 0 & 0 & 0 & 0 & 0 \\ 0 & \lambda y_3 & 0 & 0 & 0 & 0 \\ 0 & \lambda y_4 & 0 & 0 & 0 & 0 \\ 0 & 0 & \lambda y_5 & 0 & 0 & 0 \\ 0 & 0 & \lambda y_6 & 0 & 0 & 0 \\ 0 & 0 & 0 & \lambda y_7 & 0 & 0 \\ 0 & 0 & 0 & \lambda y_8 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \lambda y_9 \\ 0 & 0 & 0 & 0 & 0 & \lambda y_{10} \end{bmatrix} \begin{bmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \\ \eta_4 \\ \eta_5 \\ \eta_6 \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \varepsilon_4 \\ \varepsilon_5 \\ \varepsilon_6 \\ \varepsilon_7 \\ \varepsilon_8 \\ \varepsilon_9 \\ \varepsilon_{10} \end{bmatrix}$$

The variance/covariance matrix $\underset{\sim}{\Theta}_{\varepsilon}$ is diagonal and the matrix of covariances between $\underset{\sim}{\eta}$ and $\underset{\sim}{\varepsilon}$ is assumed to be null.

(ii) The structural equation model is described by the equation:

$$\eta_j = \beta_{jk}\ \eta_k + \zeta_j$$

where j =1,2,3,4,5 and k = 5,6. In matrix notation this may be written as:

$$\underset{\sim}{\eta} = \underset{\sim}{\beta}\ \underset{\sim}{\eta} + \underset{\sim}{\zeta}$$

$$\begin{bmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \\ \eta_4 \\ \eta_5 \\ \eta_6 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 & 0 & \beta_{15} & 0 \\ 0 & 0 & 0 & 0 & \beta_{25} & 0 \\ 0 & 0 & 0 & 0 & \beta_{35} & 0 \\ 0 & 0 & 0 & 0 & \beta_{45} & 0 \\ 0 & 0 & 0 & 0 & 0 & \beta_{56} \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \\ \eta_4 \\ \eta_5 \\ \eta_6 \end{bmatrix} + \begin{bmatrix} \zeta_1 \\ \zeta_2 \\ \zeta_3 \\ \zeta_4 \\ \zeta_5 \\ 0 \end{bmatrix}$$

The variance/covariance matrix $\underset{\sim}{\Psi}$ of the disturbance terms ζ_j is:

$$\underset{\sim}{\Psi} = \begin{bmatrix} \psi_{11} & 0 & 0 & 0 & 0 & 0 \\ 0 & \psi_{22} & 0 & 0 & 0 & 0 \\ 0 & 0 & \psi_{33} & 0 & 0 & 0 \\ 0 & 0 & 0 & \psi_{44} & 0 & 0 \\ 0 & 0 & 0 & 0 & \psi_{55} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

Defensiveness η_6 is assumed to be uncorrelated with the disturbance terms ζ_j. When the model in Figure 1.4 is fully standardised so that all variables have mean zero and variance one, the model parameters may be interpreted as follows:

(i) The coefficients λ_{yi} represent the correlations between the observed subscale scores y_i ($i = 1$ to 10) and the subscale true scores η_j ($j = 1,2,3,4,6$). λ_{yi}^2 is the reliability of y_i as a measure of η_j.

(ii) The coefficients β_{15}, β_{25}, β_{35}, β_{45} represent the direct regression of the subscale scores corrected for reliability (η_1, η_2, η_3, η_4) on global self-esteem (η_5). For the standardised model, these coefficients represent the correlations between global self-esteem and the subscales. Equivalently, the squares of the standardised coefficients give estimates of the component of variance in the subscales (η_1, η_2, η_3, η_4) which is accounted for by global self-esteem (η_5).

(iii) The coefficient β_{56} represents the regression of global self-esteem (η_5) on defensiveness (η_6). For the standardised model this coefficient is also the correlation between defensiveness and global self-esteem. Equivalently, the square of the standardised

coefficient β_{56} gives an estimate of the component of variance in global self-esteem which is attributable to defensiveness.

(iv) It follows from (iii) above that the variance ψ_{55} of the disturbance term ζ_5 represents the component of global self-esteem that is uncontaminated by the effects of defensiveness. This may be seen from:

$$\begin{aligned} \text{Var}(\eta_5) &= E(\beta_{56}\eta_6 + \zeta_5)^2 \\ &= \beta_{56}^2 \text{Var}(\eta_6) + 2\beta_{56}\text{Cov}(\eta_6\zeta_5) + \text{Var}(\zeta_5) \\ &= \beta_{56}^2 \text{Var}(\eta_6) + \psi_{55} \end{aligned}$$

since it is assumed that Cov $(\eta_6\ \zeta_5) = 0$. Clearly β_{56}^2 Var (η_6) represents the component of variance in η_5 which is attributable to the contaminating effects of defensiveness η_6, and ψ_{55} represents the component of variance in η_5 which is uncontaminated by defensiveness. Thus it is possible using confirmatory factor methods to estimate and take account of the effects of systematic measurement error arising from sources such as defensiveness.

(3) Model Identification

Thus far the model has been expressed in abstract terms with no attention given to whether the model parameters are identified. The concept of identification in structural equation models has been discussed at length by Long (1983a, 1983b). In general, to establish the identification status of a model, it is necessary to show that there is sufficient information in the variance/covariance matrix of the observed variables to estimate the unknown model parameters. The most direct approach for assessing identification is by expressing the variances and covariances of the observed variables as functions of

the model parameters and demonstrating that at least one estimate of all parameters can be secured. The full identification status of the model is shown in Appendix I. Only the elements of the argument are presented here.

The matrix of the variances and covariances of the observed variables y_i (i = 1 to 10) is a symmetric matrix of dimension 10 x 10, containing 55 unique variances and covariances. According to the model these variances and covariances are explained by 30 model parameters. For the fully standardised model in which the variances of all variables, both latent and observed, are fixed to unity, the unknown model parameters are:

(i) the ten coefficients: λ_{y_1} to $\lambda_{y_{10}}$

(ii) the ten error variances: $\Theta_{\varepsilon 1}$ to $\Theta_{\varepsilon_{10}}$

(iii) the five coefficients: β_{15}, β_{25}, β_{35}, β_{45}, β_{56}.

(The variances of the ζ_j terms are not unknown model parameters in the standardised model, since the value of these terms is determined by the value of the corresponding β_{jk} coefficients). It can be shown (see Appendix I) by expressing the 55 variances and covariances of the observed variables in terms of the 25 unknown model parameters, that the model is identified without further restriction. The model is in fact overidentified with 55 - 25 = 30 degrees of freedom. Thus the model is falsifiable to the extent that it will not fit the data as a matter of mathematical necessity and thence can be rejected on the basis of poor fit.

(4) Self-Esteem and External Variables

While the confirmatory factor model described above makes it possible to examine the internal structure of the SEI,

and the issues of reliability and factorial validity, it fails to take account of the way in which SEI scores are influenced systematically by external explanatory variables. This issue is taken up in detail in Chapter 4 which assesses the relationships between self-esteem and a variety of other measures. The discussion of how the confirmatory factor model may be extended to account for these relationships is deferred until Chapter 4, since this development is based on the empirical findings of the structure of the SEI which are described in Chapter 3.

CHAPTER II

METHOD

2.1 INTRODUCTION

The data described in this thesis were collected during the course of the Christchurch Child Development Study where the author is employed as a graduate research worker. The Christchurch Child Development Study is a longitudinal study of a birth cohort of 1265 children born in the Christchurch urban region during the period 15 April 1977 to 5 August 1977. The main aims of the project are threefold:

(i) to examine a number of issues relating to illness and health in a child population

(ii) to examine the community health services provided to children and patterns of utilization of these services

(iii) to examine the social, economic and other factors which may place children at a disadvantage socially, physically and emotionally (Christchurch Child Development Study, 1982).

Table 2.1 shows the overall design of the Christchurch Child Development Study and the ages at which data have been collected. The cohort of children has been studied at birth, at four months and at annual intervals to the age of ten years. Data have been collected at these intervals using a variety of methods including maternal interviews, teacher questionnaires and direct psychometric testing of the children (Fergusson, Horwood & Shannon, 1986).

Table 2.1: Data Collection Methods Employed From Birth to Ten Years.

Age of Child	Maternal Interview	Teacher Questionnaires	Psychometric Testing
0	1	0	0
4 Months	1	0	0
1 Year	1	0	0
2 Years	1	0	0
3 Years	1	0	0
4 Years	1	0	0
5 Years	1	0	0
6 Years	1	1	0
7 Years	1	1	0
8 Years	1	1	1
9 Years	1	1	1
10 Years	1	1	1

0 denotes data not collected
1 denotes data collected

In late 1986, it was decided within the Christchurch Child Development Study that an area deserving attention was the study of self-esteem in children. This interest was prompted by the rapidly increasing body of scientific literature on the importance of self-esteem, and by the frequency of popular comment on the way in which social, academic and other factors influence self-esteem.

To examine these issues the Christchurch Child Development Study's data collection procedures were expanded in 1987 and measures of the childrens' levels of self-esteem were obtained at ten years. The methods of data collection, measurement procedures and associated issues are described below.

2.2 DATA COLLECTION METHODS

The three methods of data collection employed in this study are outlined below.

(1) Maternal Interview

The mother of each study child was interviewed at home by a trained Christchurch Child Development Study survey interviewer. This structured interview was conducted verbally and maternal responses were noted by the interviewer in precoded answer boxes provided on the questionnaires. Typically the interview lasted about one hour and covered the following areas relating to the child and the child's family:

(i) child's behaviour and development

(ii) child's health history

(iii) family structure and stability

(iv) family income and occupational status

In addition, the survey interviewer completed a series of five point rating scales noting her impressions of the family's living standards, degree of financial difficulties and quality of housing (Fergusson, Horwood & Beautrais, 1981).

(2) Teacher Questionnaire

When the study children began school, approval was sought from New Zealand's regional education boards for information to be obtained about the behaviour and progress of the children at school. The classroom teacher of each Christchurch Child Development Study child was contacted in writing and asked to complete a questionnaire which examined the following areas:

(i) child's behaviour at school

(ii) child's progress at school

(iii) school referrals to community health and education services

(iv) school attendance

Written consent was always obtained from the child's mother prior to the study making this contact.

(3) Psychometric Testing

Psychometric testing of the children was conducted at eight, nine and ten years. Owing to logistic and financial constraints, this testing was limited to the sample of children resident in the Canterbury region. Each child was tested individually at school by trained testing staff recruited by the project. The tests administered included tests of intelligence, reading ability and self-esteem. Written consent was always obtained from the child's mother prior to testing.

While it is clear from this discussion that the data for the present analysis were collected within the general framework of the

Christchurch Child Development Study, the author's personal contribution has not been made explicit. In relation to this thesis the author's input was threefold:

(i) The author was responsible for assessing the existing scientific literature on self-esteem, and for the selection of the self-esteem instrument employed and its inclusion into the Christchurch Child Development Study's data collection processes.

(ii) The author participated in the collection of data over a three year period. Each year the author visited over 200 families scattered throughout New Zealand, conducting maternal interviews.

(iii) The author was responsible for the collation and analysis of the self-esteem data obtained at ten years.

Thus, the author was responsible for the design and analysis of the present material, and was partially responsible for collecting the data on which the thesis is based.

2.3 DEFINITION OF VARIABLES

From the large body of data collected from the sources described above, a number of variables were extracted for the present analysis. Table 2.2 lists these variables, the age of the child when measures were obtained and the source of data collection employed. Each of these variables is described in detail below:

Table 2.2: Variables Used in Analysis

Variable	Method of Measurement	Subjects Age (Years) at Measurement	Source of Measurement
Dependent Variables:			
Self-Esteem	SEI School Form	10	Psychometric Testing
Defensiveness	SEI School Form (Lie Scale)	10	
Independent Variables:			
(i) Academic Ability:			
Intelligence	WISC-R	8	Psychometric Testing
School Performance	Teacher Ratings	10	Teacher Questionnaire
(ii) Family and Social Background:			
Child's Gender	Maternal Reports on structured survey items	0	Maternal Interview
Child's Ethnicity		0	
Birth Order		0	
Maternal Age		0	
Maternal Education		0	
Family Socioeconomic Status	Elley & Irving Index	10	
Family Living Standards	Interviewer Ratings	0-10	
(iii) Childhood Stability:			
Changes of Parents	Maternal Reports on structured survey items	0-10	Maternal Interview
Changes of Residence		0-10	
Changes of School		6-10	

(1) Dependent Variables: Self-Esteem and Defensiveness.

The Coopersmith Self-Esteem Inventory (SEI) school form (Coopersmith, 1981) was the instrument chosen to measure child's self-esteem at ten years. The reasons for this choice have been outlined earlier. The school form is designed for use with subjects aged 8 through 15 years. It is comprised of 58 descriptive or evaluative statements, 50 of which are "designed to measure evaluative attitudes toward the self in social, academic, family and personal areas of experience" (Coopersmith, 1981: 1). The remaining eight items constitute the defensiveness (lie) scale and are indicative of extremely socialized response sets. For example, two of these items are:

"I always do the right thing"

"I'm never shy"

A copy of the SEI form used in this study is presented in Appendix II (II.1).

Table 2.3 shows the number of test items which comprise each of the five subscales of the SEI. As can be seen from this table, the items fall into three categories: those indicative of high self-esteem; those indicative of low self-esteem; and those indicative of defensiveness. Each item was scored dichotomously, with the child indicating whether the item was 'like me' or 'unlike me'. Self-esteem scores were constructed according to the methods outlined in the test manual (Coopersmith, 1981). The high self-esteem items scored 'like me' and the low self-esteem items scored 'unlike me' were summed. This produced scale dimensions in which

increasing scores were indicative of increasing self-esteem. Defensiveness scores were constructed by summing the defensiveness items scored 'like me'. For this scale, increasing scores were indicative of increasing defensiveness.

Table 2.3: SEI Items Indicative of High and Low Self-Esteem and Defensiveness.

	Items Indicating:			
SEI Subscales	High Self-Esteem	Low Self-Esteem	Defensiveness	Total
General	8	18	0	26
Academic	3	5	0	8
Social	4	4	0	8
Home	3	5	0	8
Defensiveness	0	0	8	8
TOTAL	18	32	8	58

For the purposes of the present analysis, eight measures of self-esteem and two measures of defensiveness were obtained for each child. These measures were the child's score on split half forms of the five subscales of the SEI. Split half measures were constructed to obtain at least two indicator measures for the constructs purportedly measured by the SEI. The split half scales were constructed by a random division of the subscale items into two groups. These groups were balanced for the number of items indicating high self-esteem. Table 2.4 shows the number of test

items which comprised each of the ten split half measures. As can be seen from this table, the split half scores for the general subscale (General 1, General 2) were sums of thirteen items each. The remaining split half scores were sums of four items each. The subscale score distributions are shown in Appendix II (II.1). These split half scores were the observed variables which were used to test the hierarchical model of self-esteem proposed in Chapter 1 (1.5).

Table 2.4: SEI Items Comprising the Self-Esteem and Defensiveness Split Half Scales

	Items Indicating:			
Split Half Scales	High Self-Esteem	Low Self-Esteem	Defensiveness	Total
Self-Esteem				
General 1	4	9	0	13
General 2	4	9	0	13
Academic 1	2	2	0	4
Academic 2	1	3	0	4
Social 1	2	2	0	4
Social 2	2	2	0	4
Home 1	2	2	0	4
Home 2	1	3	0	4
Defensiveness				
Defensiveness 1	0	0	4	4
Defensiveness 2	0	0	4	4
TOTAL	18	32	8	58

(2) Independent Variables

A number of measures were selected as independent variables which were likely to influence levels of self-esteem. Selection of variables was determined by the theoretical considerations outlined in Chapter 1 and by the availability of data from the Christchurch Child Development Study. These variables may be classified in three categories:

(a) Academic Ability

(i) Intelligence: Child intelligence was measured at age eight years using the Wechsler Test of Child Intelligence (WISC-R; Wechsler, 1974). Scores were constructed according to the test manual for full-scale intelligence.

(ii) School Performance: At ten years each child's class teacher rated the child's performance in the areas of reading, written expression, spelling and mathematics. The ratings were made on standard five point scales which are conventionally used by New Zealand teachers to describe the performance of primary and secondary school children. The ratings ranged from 'very good' to 'very poor' and higher scores were indicative of better performance.

The reliabilities of the measures of academic ability are shown in Table 2.5. The reliability of intelligence was estimated on the basis of split half correlations corrected for test length using the Spearman Brown formula (Guilford & Fruchter, 1973). The estimate of 0.93 indicates that the WISC-R is a very reliable instrument. Since longitudinal data on teacher ratings of school performance was available from age seven years onwards, it was

possible to estimate the reliabilities of these measures using the panel design model described by Heise (1969) and Wiley and Wiley (1970). Test reliabilities for teacher ratings were moderately good and varied between 0.66 to 0.78.

Table 2.5: Reliability Estimates for Measures of Cognitive Ability

Measures	Reliability Estimates for Measures Observed at Age:
IQ (WISC-R)	8 Years
Total IQ	.93
School Performance (Teacher Ratings)	10 Years
Reading	.78
Written Expression	.68
Spelling	.71
Mathematics	.66

(b) Family and Social Background

(i) Child's Gender: This was recorded at the child's birth.

(ii) Child's Ethnicity: Children were classified as Polynesian (i.e. Maori, Pacific Islander) or Pakeha (i.e. of European extraction) on the basis of maternal definition of the child's race.

(iii) Birth Order: This was recorded at the birth of the child and classified as: first child born to family; second child

born; third child born; fourth child born; child born fifth or later.

(iv) Maternal Age: This was recorded at the birth of the child and classified as: mother aged less than 20 years; 20 to 24 years; 25 to 29 years; 30 years and over.

(v) Maternal Education: This was classified as: mother lacked formal educational qualifications; mother had secondary school qualifications (New Zealand School Certificate, University Entrance); mother had tertiary qualifications (university degree, technical diploma).

(vi) Family Socioeconomic Status (SES): This was measured at ten years on the Elley & Irving (1976) scale of socioeconomic status for New Zealand. This scale divides the population into six social classes on the basis of male occupation. The traditional scale scores were reversed so that high scores indicated high socioeconomic levels. The classes were: 1, 2 = semi-skilled/unskilled; 3, 4 = clerical/technical/skilled; 5, 6 = professional/managerial. Families in which the father or male head was absent or unemployed remained unclassified.

(vii) Averaged Family Living Standards: At each year survey interviewers were asked to rate the family's material conditions on a five point rating scale ranging from 'very good, obviously affluent' to 'very poor, family obviously in poverty', with high scores indicative of high standards of living. To obtain an estimate of the typical material conditions of the family during the child's lifetime, the interviewer ratings were summed over the ten year period and divided by ten.

(c) Childhood Stability

(i) Changes of Parents: During the maternal interview each year mothers were questioned about any changes in the child's parent figures for each month of that year. Thus a month-by-month history of family composition was available for the period from birth to ten years and it was possible to count the number of changes in parent figures experienced by each child. For the purposes of the present study, a change in parents was defined as any situation in which either of the child's (resident) parent figures changed for a period of longer than three months. A change thus included such things as marital breakdown, a single parent entering a cohabiting relationship and the long term institutionalization of the child or either parent. It excluded such things as parental absences on business trips or holidays.

(ii) Changes of Residence: Records were kept of the number of changes of residence experienced by the child from birth to ten years.

(iii) Changes of School: Records were also kept on the number of schools each child attended from ages five to ten years.

2.4 QUALITY CONTROL OF DATA

The following procedures were used to quality control the study data:

(i) Every week each interviewer reported to the survey headquarters. All interviews were then checked in the interviewer's presence for consistency and sense. If any discrepancies were

detected, these were clarified by discussion with the interviewer, or where this was not possible, by re-interviewing the mother on the relevant questions.

(ii) Every week each psychometric tester reported to the survey headquarters where the testing schedules were checked in a similar way.

(iii) When each teacher questionnaire was returned to survey headquarters, this was also checked for consistency and sense. If any discrepancies were found or if any sections were incomplete, these were returned to the teacher for clarification or completion.

(iv) The precoded interviews, testing schedules and teacher questionnaires were transcribed to magnetic tape storage. A ten percent random sample of records was cross-checked with the source documents. This revealed that the frequency of mispunching was about one in every 5000 digits.

(v) All stored records were edited for errors by checking that variable values lay within permissible ranges and prior to any analysis data consistency checks were made to ensure that the variables under consideration were consistent.

2.5 ETHICAL ISSUES

(1) Consent

Written consent was obtained from the mother of each study child before any information relating to that child or that child's family was used by the Christchurch Child Development Study. Three types of consent forms were presented to the mothers.

(i) After the completion of the maternal interview each year, the mother was asked to sign a consent form which stated that the aims and objectives of the study had been explained to her and that she had supplied the study with information of her own free will.

(ii) From the age of six years and prior to the child's class teacher being contacted, mothers were asked to sign a school questionnaire consent form. This form stated that she agreed to information about her child's school work, adjustment to school and behaviour at school being provided to the Christchurch Child Development Study.

(iii) From the age of eight years and prior to the psychometric testing of the child, the mother of each child resident in the Canterbury region was asked to sign a psychometric testing consent form. This form stated that she agreed to Christchurch Child Development Study testing staff visiting her child at school to administer tests of scholastic ability, intelligence, language development and self-esteem.

Care was taken to ensure that mothers understood the contents of the forms they signed, and that participation in the study was voluntary and they were free to withdraw from the study at any time.

(2) Confidentiality

All consent forms used in the study also guaranteed mothers complete confidentiality. The forms stated that the information

collected by the Christchurch Child Development Study was to be used for research purposes only and that it would not be released to any third party in a form that could be associated with her or her family. To further safeguard the confidences of its respondents, the Christchurch Child Development Study has devised a complex coding system of data storage. For anyone to be able to make sense of this data, it would be necessary to have a detailed knowledge of the steps required to interpret the coded data and access to the coding lists which are stored under lock and key.

(3) Feedback

At each year the families participating in the Christchurch Child Development Study were given feedback on how the information they have provided has been put to use. Each family receives a written newsletter which summarises the aims and objectives of the study, areas of ongoing research and a simplified account of the papers which the study has submitted for publication. This newsletter is discussed with the child's mother at the time of the maternal interviews. Copies of the published papers are available to the families on request.

(4) Intervention

The Christchurch Child Development Study takes a strictly non-interventionist approach to the families it studies. Firstly, it is made clear to all Christchurch Child Development Study staff that the study aims to examine families as they are, not as the staff would like them to be. Secondly, it is emphasised that staff should fill the role of sympathetic, but disinterested

observers, in order to avoid being seen as interferring or meddling. Any staff members who have encountered a situation where they believed that intervention was required, were instructed to refer this issue to the study's principal investigator. To date no form of intervention has proved necessary.

2.6 SAMPLE SIZE

The initial sample size was 1265. Over the ten year period that these children have been studied, a number of children have been lost to follow-up. These losses are accounted for by three factors:

(i) families moving from New Zealand (7.4%)

(ii) families declining further participation (7.0%)

(iii) childhood deaths (1.3%)

By the age of ten years, 1067 children remained in the study. However, because of limitations in the data collection process, information was not available for all variables on the full sample of 1067. In particular, only those children resident in the Canterbury region were given psychometric testing. Thus, measures of self-esteem and cognitive ability were available for only 843 children. These sample losses are summarised in Table 2.6.

Table 2.6: Sample Classification at Ten Years

Birth Cohort Members	N	%
(a) Remaining in the study at ten years		
(i) Received Psychometric Testing	843	66.6
(ii) Did not receive Psychometric Testing	224	17.7
(b) Withdrawn from the study by ten years		
(i) Family moved overseas	94	7.4
(ii) Family refused further participation	88	7.0
(iii) Child died	16	1.3
TOTAL	1265	100

The 843 children for whom complete data were available represented 67% of the original cohort and 73% of the sample who were alive and resident in New Zealand at ten years. Since it was possible that this subsample was influenced systematically by sample selection factors (Berk, 1983), a series of comparisons were conducted between these children and the remaining 422 cohort members who were either, not assessed at ten years, or who were assessed, but lived outside the Canterbury region and thence were not given psychometric testing. Table 2.7 summarises the results of these comparisons.

The table shows that there was little bias in the sample of children who received psychometric testing. These children did not differ from the other children on a range of measures including gender, maternal age, maternal education, family socioeconomic

status or the child's birth order. There was, however, a tendency ($p<.01$) for children of Polynesian ethnic status to be under-represented. Of the 179 Polynesian children in the original cohort, only 58% (103) received psychometric testing at ten years. In contrast, 68% of children of Pakeha ethnic origin received psychometric testing. At the same time, this bias in the sample was relatively small, and it seems unlikely that it would have an appreciable effect on the results reported here.

Table 2.7: Percentage of Children in Present Sample Compared on Birth Measures

Variable	Birth Cohort N	% Studied At 10 Years	Significance
SEX			
Boy	635	66.3	N.S.
Girl	630	67.0	
ETHNICITY			
Polynesian	179	57.5	$p<.01$
Pakeha	1086	68.1	
MATERNAL AGE			
< 20 Years	122	62.3	
20-24 Years	392	65.1	
25-29 Years	491	67.4	N.S.
30 + Years	260	69.6	
MATERNAL EDUCATION			
No formal qualifications	647	67.8	
Secondary qualifications	383	64.8	N.S.
Tertiary qualifications	235	66.4	
SOCIOECONOMIC STATUS			
1, 2 = Semi-skilled/unskilled	342	64.0	
3, 4 = Clerical/technical/skilled	668	68.0	N.S.
5, 6 = Professional/managerial	255	66.7	

Table 2.7: continued

Variable	Birth Cohort N	% Studied At 10 Years	Significance
BIRTH ORDER			
1st born	485	65.6	
2nd born	456	66.4	
3rd born	227	70.0	N.S.
4th born	64	57.8	
5th +	33	78.8	

CHAPTER III

RESULTS I: THE STRUCTURE OF SELF-ESTEEM

3.1 INTRODUCTION

This chapter presents the results of fitting the hierarical model of self-esteem to the sample data collected from 843 ten year old children. The model specifications have been outlined in Chapter 1 (1.5). Briefly, this model proposes that a portion of the variance in the SEI scores is accounted for by four self-esteem constructs: the child's self-esteem in the general, academic, social and home areas of experience. In turn, the relationships between these specific self-esteem constructs are accounted for by a general underlying factor, the child's global self-esteem. Defensiveness is represented as a source of systematic variance which affects the child's overall reporting behaviour. To test this model, a total of ten measures were obtained per subject. These measures were the scores computed for each child on split half forms of the five SEI subscales. This provided two indicators for each of the four specific self-esteem constructs and for the defensiveness construct. The model fitting procedures and interpretation of the fitted model are outlined below.

3.2 MODEL FITTING AND INTERPRETATION

(1) Correlational Data

Table 3.1 shows the matrix of correlations (and standard deviations) of the ten observed measures.

Table 3.1: Correlations Between Split Half Measures of Self-Esteem and Defensiveness

	Gen 1	Gen 2	Acad 1	Acad 2	Soc 1	Soc 2	Home 1	Home 2	Def 1	Def 2
Gen 1	1.000									
Gen 2	0.710	1.000								
Acad 1	0.527	0.513	1.000							
Acad 2	0.597	0.597	0.516	1.000						
Soc 1	0.427	0.443	0.383	0.366	1.000					
Soc 2	0.470	0.445	0.409	0.386	0.491	1.000				
Home 1	0.487	0.497	0.391	0.451	0.278	0.273	1.000			
Home 2	0.524	0.492	0.383	0.459	0.312	0.334	0.610	1.000		
Def 1	0.119	0.068	0.197	0.092	0.094	0.109	0.096	0.027	1.000	
Def 2	0.111	0.069	0.147	0.099	0.097	0.136	0.077	0.088	0.490	1.000

Notation: Gen 1, Gen 2 = split half measures of the general subscale;
Acad 1, Acad 2 = split half measures of the academic subscale;
Soc 1, Soc 2 = split half measures of the social subscale;
Home 1, Home 2 = split half measures of the home subscale;
Def 1, Def 2 = split half measures of the defensiveness scale.

The correlations may be interpreted as follows:

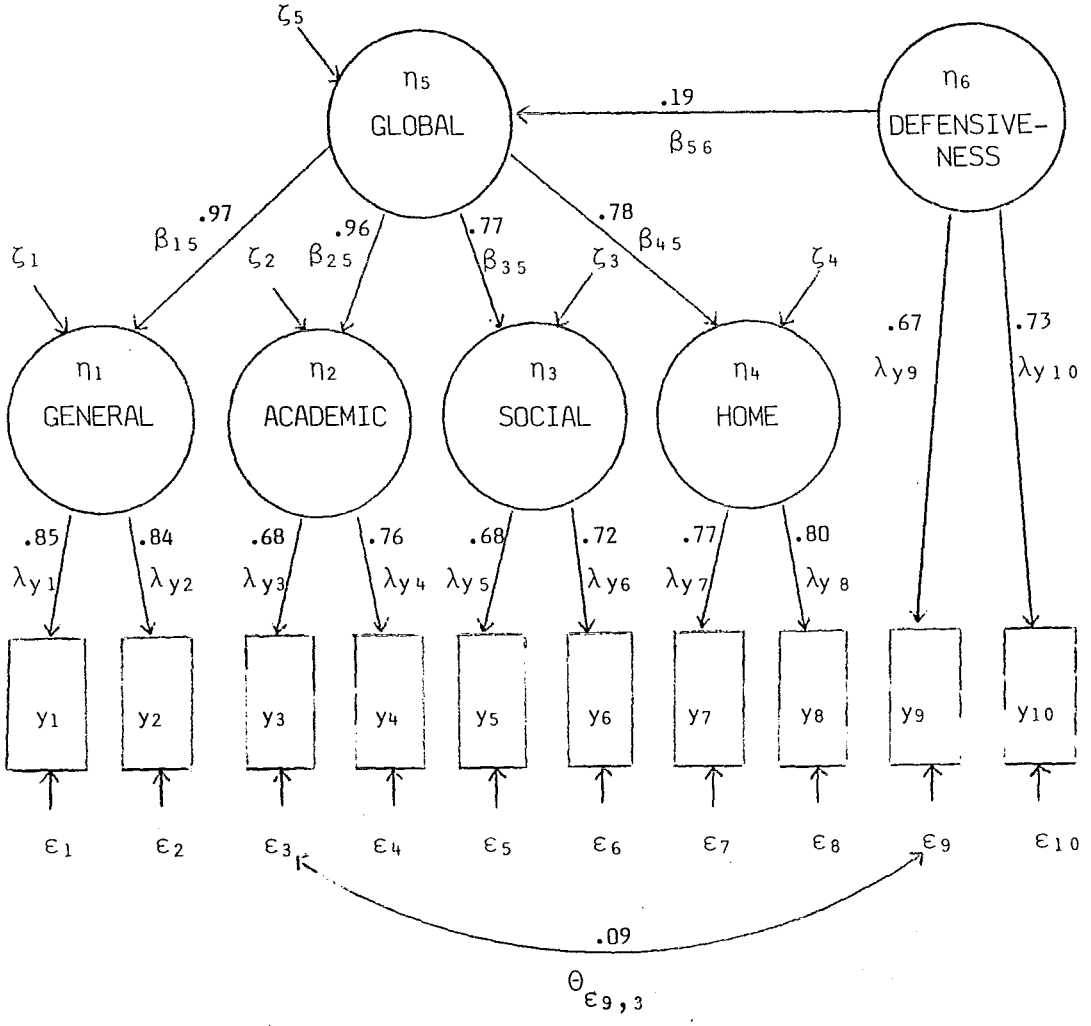
(i) The correlations between split half measures of the same subscale (e.g. between Gen 1 and Gen 2) are indices of the reliability of the subscale. These within subscale correlations range from 0.49 to 0.71. Using the Spearman Brown formula (Guilford & Fruchter, 1973) this implies full scale reliabilities ranging from 0.65 to 0.83. These reliabilities suggest that the SEI subscales are of moderately good reliability and they lie within the general range of those cited in previous studies (see Chapter 1: Table 1.1).

(ii) The correlations between split half measures of different subscales describe the associations between subscales. These correlations range from 0.27 to 0.60 for the self-esteem subscales suggesting that all the self-esteem measures are related. The correlations between the defensiveness subscales and the self-esteem subscales ranged from 0.03 to 0.20 suggesting the presence of a small positive relationship between self-esteem and defensiveness. These correlations are consistent with the subscale intercorrelations cited by Coopersmith (1981), and with those reported by Edgar et al, (1974) and Nicholls (1967).

(2) Parameter Estimation

The hierarchical model of self-esteem was fitted to the variance/covariance matrix of the raw score values implied by Table 3.1. Model fitting was conducted using maximum likelihood estimation and the programme LISREL VI (Joreskog & Sorbom, 1984). Figure 3.1 shows the standardised parameter estimates of the fitted model. In this figure the variables are denoted as follows:

FIGURE 3.1: Standardised Hierarchical Model of Self-Esteem



Notation:

yi = ith observed split half indicator

ηj = non observed true score of jth subscale (j = 1,2,3,4)

η_5 = higher order construct of global self-esteem

η_6 = non observed true score of defensiveness scale

εi = random errors of measurement on ith indicator

ζk = disturbance term on ηk (k = 1,2,3,4,5)

λyi = regression coefficient linking yi to ηj

βj_5 = regression coefficient linking ηj to η_5

β_{56} = regression coefficient linking η_5 to η_6

$\Theta\varepsilon_{9,3}$ = correlation between disturbance terms ε_3, ε_9

(i) The pairs of split half measures for the general, academic, social, home and defensiveness subscales are denoted y_1, y_2; y_3, y_4; y_5, y_6; y_7, y_8; y_9, y_{10} respectively.

(ii) The general, academic, social and home self-esteem factors are denoted η_1, η_2, η_3, η_4, respectively.

(iii) The higher order factor of global self-esteem is denoted η_5.

(iv) The defensiveness factor is denoted η_6.

The standardised model parameters may be interpreted as follows:

(i) The coefficients λ_{yi} (i = 1 to 10) linking the observed measures y_i to the corresponding specific factors η_j (j = 1,2,3,4,6) are estimates of the correlations between the specific factors and their indicators. Equivalently the squares of the coefficients are estimates of the reliability of the indicators. The coefficients λ_{yi} range from 0.67 to 0.85 suggesting relatively good, but by no means perfect, correlations between the observed variables and the underlying specific self-esteem factors.

(ii) The coefficients β_{15}, β_{25}, β_{35}, β_{45} linking the specific factors to the second order factor of global self-esteem are estimates of the correlations between the second order factor and the specific self-esteem factors. These coefficients range from 0.77 to 0.97 suggesting that the specific factors are strongly related to the underlying global factor.

(iii) The coefficient β_{56} linking global self-esteem to defensiveness is an estimate of the effect of defensiveness on

global self-esteem. The estimated coefficient of 0.19 suggests that defensiveness has a modest contaminating effect on the reporting of self-esteem.

(iv) The fitted model presented in Figure 3.1 contains a further free parameter $\Theta\varepsilon_{93}$ which was not included in the model outlined in Chapter 1 (1.5). During the model fitting procedures it became evident that a better fit between the observed data and the model would be obtained if a correlation was allowed between the disturbance terms for the first measure of academic self-esteem (y_3) and the first measure of defensiveness (y_9). Allowing this parameter to be free resulted in a highly significant improvement in model fit ($X^2 = 13.25$, df = 1, $p<.001$). (Overall model fit will be discussed at length later in this chapter). The freeing of this parameter does not change the interpretation of the model substantively. The parameter $\Theta\varepsilon_{93}$ has an estimated value of 0.09 suggesting a small positive association between the two error sources, ε_3 and ε_9.

Further insight into the implications of the model can be gained from estimating the contribution of the latent constructs to the variability in the observed indicators.

(3) Components of Variance in Self-Esteem Indicators

From the theoretical model outlined in Chapter 1 (1.5) it is evident that the self-esteem indicators y_i (i = 1 to 8) may be described by the equation:

$$y_i = \lambda_{yi}\beta_{j5}\beta_{56}\eta_6 + \lambda_{yi}\beta_{j5}\zeta_5 + \lambda_{yi}\zeta_j + \varepsilon_i \quad (j = 1,2,3,4)$$

since $y_i = \lambda_{yi}\eta_j + \varepsilon_i$

$$\eta_j = \beta_{j5}\eta_5 + \zeta_j$$

$$\eta_5 = \beta_{56}\eta_6 + \zeta_5$$

It follows that for the standardised model (where all observed and latent variables have mean zero and standard deviation one) the variance of the indicators y_i may be expressed as

$$\begin{aligned} Var(y_i) &= E(\lambda_{yi}\beta_{j5}\beta_{56}\eta_6 + \lambda_{yi}\beta_{j5}\zeta_5 + \lambda_{yi}\zeta_j + \varepsilon_i)^2 \\ &= \lambda_{yi}^2\beta_{j5}^2\beta_{56}^2 + \lambda_{yi}^2\beta_{j5}^2 Var(\zeta_5) + \lambda_{yi}^2 Var(\zeta_j) + Var(\varepsilon_i) \\ &= \lambda_{yi}^2\beta_{j5}^2\beta_{56}^2 + \lambda_{yi}^2\beta_{j5}^2(1-\beta_{56}^2) + \lambda_{yi}^2(1-\beta_{j5}^2) + (1-\lambda_{yi}^2) \end{aligned}$$

Clearly the variance of the self-esteem indicators is an additive function of the model parameters λ_{yi}, β_{j5} and β_{56}. Each of the components in the equation above has a clear psychometric interpretation:

(i) The component $\lambda_{yi}^2\beta_{j5}^2(1-\beta_{56}^2)$ reflects the contribution of global self-esteem η_5 (corrected for the effects of defensiveness) to the variability in the indicators. This component may be regarded as the proportion of variance in the observed measures which reflects (true score) global self-esteem.

(ii) The component $\lambda_{yi}^2(1-\beta_{j5}^2)$ reflects the contribution of the specific self-esteem factors (η_1, η_2, η_3, η_4) independently from global self-esteem, to the variability in the observed indicators.

(iii) The component $\lambda_{yi}^2\beta_{j5}^2\beta_{56}^2$ reflects the contaminating effects of defensiveness (η_6) via its effects on global self-esteem, upon the variability in the observed indicators.

(iv) The component $1-\lambda_{yi}^2$ reflects the effects of random errors of measurement on the variance in the indicators.

Table 3.2 shows the variance in the observed indicators partitioned into the components described above. The following conclusions may be drawn from this table:

(i) All the observed indicators are of modest to moderate validity as measures of global self-esteem. The fitted model suggests that the general self-esteem indicators (y_1, y_2) are the best measures of global self-esteem with approximately 65% of the variance in these indicators accounted for by the global self-esteem construct (η_5).

Table 3.2: Components of Variance (%) in Self-Esteem Indicators

	Proportion of Variance (%) Attributable to:			
SEI Indicators	Global Self-Esteem	Specific Self-Esteem	Defensiveness	Random Errors of Measurement
y_1	65.5	4.3	2.5	27.8
y_2	64.0	4.2	2.4	29.4
y_3	41.1	3.6	1.5	53.8
y_4	51.3	4.5	1.9	42.2
y_5	26.4	18.8	1.0	53.8
y_6	29.6	21.1	1.1	48.2
y_7	34.8	23.2	1.3	40.7
y_8	37.5	25.1	1.4	36.0
y_9	-	-	44.9	55.1
y_{10}	-	-	53.3	46.7

In contrast, for the academic, social and home indicators (y_3 to y_8) 26% to 51% of the variance is accounted for by global self-esteem. The defensiveness indicators (y_9, y_{10}) are of moderate validity with 45% and 53% of their variance accounted for by the defensiveness construct (η_6).

(ii) The contribution of the specific self-esteem factors (independently of the global factor) are relatively small for the general and academic indicators (y_1 to y_4). The estimates suggest that less than 5% of the variance in these indicators is specific to the general and academic constructs (η_1, η_2). In contrast the model suggests that 19% to 25% of the variance in the social and home indicators (y_5 to y_8) reflects the specific effects of the social and home constructs (η_3, η_4).

(iii) The fitted model suggests that defensiveness (η_6) makes only a small contribution (1% to 2%) to the variability in the observed self-esteem measures. This result implies that while tendencies of defensiveness may contaminate self-esteem reports, this contamination is relatively small.

(iv) The effects of random errors of measurement on reported self-esteem scores were relatively large. For the academic, social and home indicators (y_3 to y_8) 36% to 54% of the variance reflects unreliability. In contrast, for the general indicators (y_1, y_2), unreliability accounts for less than 30% of the variance. However, it is well known that test length influences test reliability (Guilford & Fruchter, 1973). It is therefore likely that this difference is a reflection of test length since

the general indicators were based on 13 test items each, while the remaining indicators were based on 4 test items each.

It can be concluded from this analysis that the observed self-esteem measures are relatively noisy indicators reflecting complex contributions from global and specific self-esteem factors, from the contaminating effects of defensiveness and from random errors of measurement. Clearly any analyses of the association between reported self-esteem and other measures of interest will be affected by this complexity with concommitant problems of interpretation. This issue will be dealt with in the next chapter where the fitted model of self-esteem will be expanded to examine the effects of a variety of sociodemographic and academic variables. Prior to this, it is necessary to assess how well the self-esteem model fitted the observed data.

3.3 GOODNESS OF FIT

A variety of methods are available for assessing model fit. However, since each of these methods have inherent weaknesses (Horwood, 1987) it is advisable to assess model fit in a number of ways. Before the overall fit of the model is examined, the individual parameter estimates may be assessed for statistical significance. Failure to reach significance implies that these parameters can not be differentiated from zero and thence indicates a weakness in the conceptual model (Long, 1983a).

Table 3.3 presents the unstandardised model parameters and estimated standard errors for the model in Figure 3.1. The parameters λ_{y_1}, λ_{y_3}, λ_{y_5}, λ_{y_7}, λ_{y_9} and β_{15} have been fixed to a value of one in the unstandardised model in order to set the metric of the latent variables η_1, η_2, η_3, η_4, η_6 and η_5 respectively. The statistics in this table may be used to test the significance of each of the model parameters by taking the ratio of the parameter to its corresponding standard error. This ratio may be interpreted as a t-statistic with N-1 degrees of freedom where N = sample size (Joreskog & Sorbom, 1984). The table shows that with the exception of ψ_{22} (the disturbance variance of η_2), all the parameters in the fitted model are significant at the 0.05 probability level or better. Having established the utility of the individual model parameters it is now possible to examine the overall fit of the model.

(1) Log Likelihood Ratio Chi-Square Statistic (LRX^2)

The overall LRX^2 goodness of fit value for the model in Figure 3.1 is 47.65 (df = 29; $p<.02$). This result suggests the presence of a statistically significant deviation between the fitted model and the observed data. However, it is well known (Bentler & Bonett, 1980; Joreskog & Sorbom, 1984) that the size of the LRX^2 statistic tends to be inflated by large sample size and if the observed variables show departures from multivariate normality, over and above what can be expected due to specification error in the model. To overcome this problem an alternative interpretation of the LRX^2 statistic has been proposed (Schmitt, 1978). This proposition simply suggests that a large LRX^2 value indicates poor

Table 3.3: Estimates of Standardised and Unstandardised Model Parameters and Standard Errors

Parameter	Standardised Estimate	Unstandardised Estimate	Standard Error Estimate	p<
$\underline{\lambda_{yi}}$				
λ_{y_1}	0.85	1.00*	-	-
λ_{y_2}	0.84	0.95	0.04	.001
λ_{y_3}	0.68	1.00*	-	-
λ_{y_4}	0.76	1.13	0.06	.001
λ_{y_5}	0.68	1.00*	-	-
λ_{y_6}	0.72	1.18	0.08	.001
λ_{y_7}	0.77	1.00*	-	-
λ_{y_8}	0.80	0.99	0.05	.001
λ_{y_9}	0.67	1.00*	-	-
$\lambda_{y_{10}}$	0.73	1.17	0.32	.005
$\underline{\beta_{jk}}$				
β_{15}	0.97	1.00*	-	-
β_{25}	0.96	0.35	0.02	.001
β_{35}	0.77	0.23	0.02	.001
β_{45}	0.78	0.29	0.02	.001
β_{56}	0.19	0.64	0.17	.001
$\underline{\Theta\epsilon_{ii} = \text{Var}(\epsilon_i)}$				
$\Theta\epsilon_{11}$	0.28	1.63	0.13	.001
$\Theta\epsilon_{22}$	0.30	1.64	0.12	.001
$\Theta\epsilon_{33}$	0.54	0.61	0.04	.001

Table 3.3: Continued

Parameter	Standardised Estimate	Unstandardised Estimate	Standard Error Estimate	p<
$\Theta\varepsilon_{44}$	0.42	0.49	0.04	.001
$\Theta\varepsilon_{55}$	0.53	0.41	0.03	.001
$\Theta\varepsilon_{66}$	0.48	0.46	0.04	.001
$\Theta\varepsilon_{77}$	0.41	0.40	0.03	.001
$\Theta\varepsilon_{88}$	0.37	0.32	0.03	.001
$\Theta\varepsilon_{99}$	0.56	0.45	0.10	.001
$\Theta\varepsilon_{1010}$	0.47	0.39	0.13	.005
$\Theta\varepsilon_{ij} = \text{Cov}\ (\varepsilon_i\varepsilon_j)$				
$\Theta\varepsilon_{93}$	0.09	0.08	0.02	.005
$\psi_{jj} = \text{Var}\ (\zeta_j)$				
ψ_{11}	0.06	0.27	0.14	.05
ψ_{22}	0.08	0.04	0.02	.10
ψ_{33}	0.40	0.14	0.02	.001
ψ_{44}	0.40	0.23	0.03	.001
ψ_{55}	0.96	3.83	0.30	.001
$\text{Var}(\eta_6)$	1.00	0.36	0.11	.005

* denotes unstandardised parameter values fixed in order to set the scale of measurement for the latent variables.

fit and a small LRX^2 value indicates good fit. The number of degrees of freedom for the model serves as a standard for judging the size of the LRX^2 statistic. Thus an LRX^2 to df ratio approaching or less than one is indicative of adequate model fit. Using this alternative approach, the LRX^2 to df ratio of 1.64 for the fitted self-esteem model suggests an acceptable fit of the model to the data.

(2) Residual Correlations

A more direct index of fit is given by the residual correlation matrix obtained by subtracting the observed correlations from those implied by the model. A well-fitting model should have residuals which are small in relation to the size of the observed correlations and standard deviations, and which appear to be randomly distributed according to sign (Horwood, 1987). The residual correlations for the fitted model are shown in Table 3.4. The residuals range from -0.054 to +0.063. Inspection of the residuals in relation to the correlations and standard deviations of the observed data presented in Table 3.1 suggests an adequate fit of the model to the data.

(3) Goodness of Fit Index (GFI)

The GFI was developed by Joreskog & Sorbom (1984) to assess the fit of LISREL models. This index measures the amount of deviation between the observed data and the fitted model and it may be adjusted for degrees of freedom. The GFI is independent of sample size and relatively robust against departures from normality (Joreskog & Sorbom, 1984). The index ranges from 0 for an ill-fitting

Table 3.4: Residual Correlations for the Fitted Model

	Gen 1	Gen 2	Acad 1	Acad 2	Soc 1	Soc 2	Home 1	Home 2	Def 1	Def 2
Gen 1	-0.000									
Gen 2	0.000	-0.000								
Acad 1	-0.013	-0.007	-0.001							
Acad 2	-0.017	0.006	-0.000	-0.000						
Soc 1	-0.007	0.026	0.055	-0.006	-0.000					
Soc 2	0.011	0.003	0.062	-0.008	-0.000	-0.000				
Home 1	0.003	0.032	0.026	0.036	-0.015	-0.038	0.003			
Home 2	-0.000	-0.013	-0.013	0.009	-0.006	-0.003	0.003	0.004		
Def 1	0.009	-0.038	-0.024	-0.002	0.027	0.038	0.022	-0.054	0.008	
Def 2	-0.003	-0.041	0.061	0.001	0.028	0.063	-0.000	0.004	0.009	0.000

Notation: Gen 1, Gen 2 = split half measures of the general subscale;
Acad 1, Acad 2 = split half measures of the academic subscale;
Soc 1, Soc 2 = split half measures of the social subscale;
Home 1, Home 2 = split half measures of the home subscale;
Def 1, Def 2 = split half measures of the defensiveness scale.

model to 1 for a perfectly fitting model. While the statistical distribution of the GFI is unknown (Joreskog & Sorbom, 1984) values in excess of 0.90 are usually viewed as indicating adequate fit. The adjusted GFI for the fitted self-esteem model is 0.97, suggesting good fit.

Collectively the methods above indicate that there is an adequate fit between the observed data and the hierarchical model of self-esteem.

3.4 CONCLUDING COMMENTS

The preceeding analysis has implications for three major issues relating to the interpretation of the SEI. These issues are discussed below.

(1) The Latent Structure of the SEI

The analysis provides support for the view that the underlying structure of self-esteem is hierarchically ordered (Shavelson, Hubner & Stanton, 1976). Examination of model fit indices suggested that the hierarchical model of the SEI, in which the observed scores are indicators of four first order factors of specific self-esteem whose intercorrelations are explained by a higher order factor of global self-esteem, provides an adequate account of the data. This result is consistent with several previous analyses of the structure of the SEI (Roberson & Miller, 1986; Maruyama, Rubin & Kingsbury, 1981; Kokenes, 1978; Edgar et al, 1974).

However, it is important to recognise that while the data are consistent with an hierarchical model, this does not necessarily imply that this is the best model for explaining the data. Nonetheless, inspection of the model parameters (Table 3.3) and the residual correlations (Table 3.4) failed to reveal any obvious weaknesses in the model which would indicate that alternative models should be considered. Moreover, the hierarchical model has the advantage of being relatively parsimonious and easy to interpret.

(2) The Role of Defensiveness

Although previous studies of the SEI have attempted to clarify the role of the defensiveness subscale (Roberson & Miller, 1986; Edgar et al, 1974; Nicholls, 1967), no attempt has been made to link defensiveness to global self-esteem. The model described above provides an explicit account of this relationship by assuming that defensiveness influences global self-esteem and thus, has a pervasive effect on SEI scores.

The fitted model suggested that self-esteem reports were biased systematically by the subject's level of defensiveness. As defensiveness increased there was a tendency for reported self-esteem to increase. However, the model estimated that only 1% to 2% of the variance in the observed scores reflected response biases attributable to the effects of defensiveness. This implies that while between subject variations in defensiveness may systematically influence self-esteem reports, this influence is relatively small.

It should also be noted that the model makes the relatively strong prediction that the effects of defensiveness operate on global self-esteem rather than on the specific self-esteem constructs. The adequate goodness of fit indices obtained for the model provide general support for this prediction. A more precise examination of this prediction may be obtained from inspection of the modification indices estimated for the fitted model. A modification index represents the predicted χ^2 improvement of fit (df = 1) for the model should a specific parameter be freed (Long, 1983a). (Modification indices will be described in more detail in the next chapter). The modification indices linking the construct of defensiveness to the four specific self-esteem constructs range from 0.01 to 0.65. Clearly no significant improvement in model fit will be obtained from freeing any of these parameters. This provides strong support for the prediction that the effects defensiveness are mediated via global self-esteem and not via the specific constructs.

(3) The Usefulness of the SEI

While in previous analyses it has been customary to compile associations between the observed SEI scores and variables of interest (e.g. Kawash & Clewes, 1986; Cowan, Altmann & Pysh, 1978; Rubin, Dorle & Sandidge, 1977; Trowbridge, 1972; Coopersmith, 1967), the fitted model suggests that this practice is likely to produce misleading estimates of the true correlations which exist between these variables and self-esteem. The model estimates suggest that in the region of 45% to 70% of the variance in the SEI can be

attributed to between subject variation in self-esteem (both global and specific), and that the remaining variance reflects sources of unreliability and invalidity. Given these results it seems reasonable to conclude that the observed SEI scores are rather noisy measures of self-esteem for children and they are afflicted by quite substantial errors of measurement.

This result would appear to cast doubts upon the wisdom of using the SEI as a measure of self-esteem. However, a conclusion of this form would be misguided since the model described above provides a method for identifying the sources of error and for taking the appropriate corrective action. The necessary corrective action is to model the latent constructs of the model as measures of self-esteem rather than using the noisy observed measures. For this approach the errors of measurement in the SEI are explicity represented in the analysis and they are taken into account for the estimation of model coefficients. A model of this type is developed in the next chapter where self-esteem is examined in relation to a number of academic, social and family background variables.

CHAPTER IV

RESULTS II: CORRELATES OF SELF-ESTEEM

4.1 INTRODUCTION

This chapter summarizes a multivariate analysis of the relationship between SEI scores and a number of measures of cognitive ability, academic achievement and social background. While previous SEI research has identified a number of factors which may influence self-esteem (see Chapter 1: Table 1.2), there have been few studies which have examined the simultaneous effects of these factors. In this chapter a regression model is developed in order to estimate the net effects of a range of variables on self-esteem scores, taking into account the structure of the SEI. Selection of variables for this analysis was determined by their theoretical relevance and by the availability of data from the Christchurch Child Development Study data base. The variables selected for consideration were:

(i) defensiveness (measured on the SEI lie scale)

(ii) intelligence

(iii) school performance in reading, writing, spelling and mathematics (teacher ratings)

(iv) family socioeconomic status (SES)

(v) family standards of living

(vi) gender

(vii) maternal age

(viii) maternal education

(ix) birth order

(x) ethnicity

(xi) number of changes of parents

(xii) number of changes of residence

(xiii) number of changes of school.

Measurement of these predictor (explanatory or exogenous) variables has been described in Chapter 2 (2.3). The aims of the following analysis are:

(i) To estimate the net contributions of the explanatory variables to variability in self-esteem.

(ii) To examine whether these predictors affect different aspects of self-esteem in different ways.

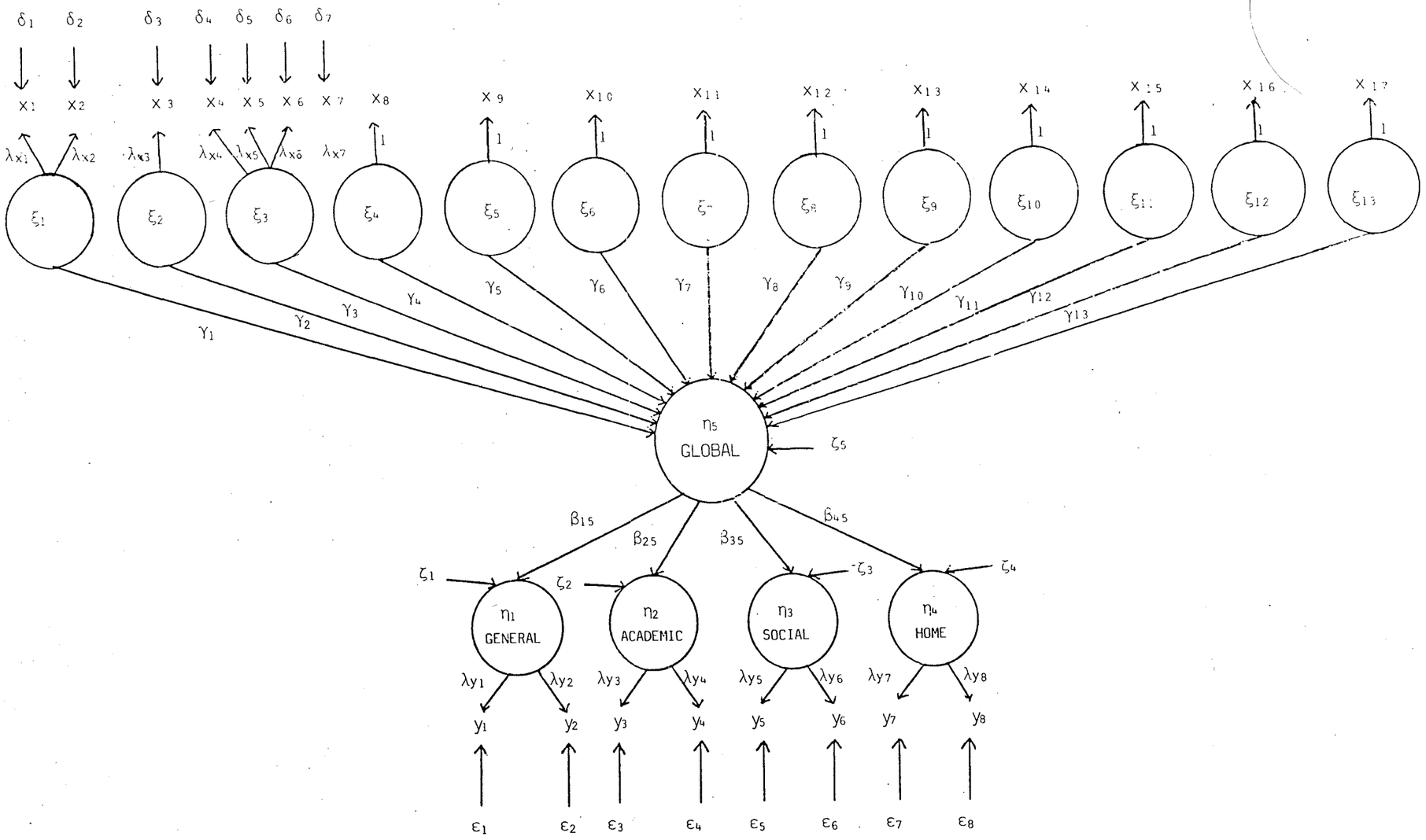
4.2 THE REGRESSION MODEL

Let ξ_1, ξ_2 ... ξ_k denote the set of exogenous variables. Figure 4.1 shows the proposed relationships between the ξ_k variables and self-esteem. While it is assumed that the ξ_k variables are intercorrelated, for simplicity these correlations are not shown in the figure. Figure 4.1 assumes that:

(i) Each ξ_k variable has a direct coefficient γ_k linking it to the construct of global self-esteem.

(ii) The effects of the ξ_k variables on the observed self-esteem measures (y_i) are mediated via global self-esteem (η_5). Thus the model makes the strong prediction that the exogenous variables only influence global self-esteem (η_5) and have no direct effects on the specific self-esteem constructs (η_1, η_2, η_3, η_4).

FIGURE 4.1: Regression Model Linking Self-Esteem to the Exogenous Variables



Notation: ξ_1= Defensiveness, ξ_2 = Intelligence, ξ_3 = School Performance, ξ_4 = SES, ξ_5 = Standards of Living, ξ_6 = Gender, ξ_7= Maternal Age, ξ_8 = Maternal Education, ξ_9 = Birth Order, ξ_{10} = Ethnicity, ξ_{11} = Changes of Parents, ξ_{12} = Changes of Residence, ξ_{13} = Changes of School.

The regression component of the model may be specified by the following LISREL equation:

$$\underset{\sim}{\eta}_5 = \underset{\sim}{\Gamma}\,\underset{\sim}{\xi} + \underset{\sim}{\zeta}_5$$

$$[\eta_5] = [\gamma_1\ \gamma_2\ \gamma_3\ \ldots\ \gamma_{13}] \begin{bmatrix} \xi_1 \\ \xi_2 \\ \xi_3 \\ \vdots \\ \vdots \\ \xi_{13} \end{bmatrix} + [\zeta_5]$$

For brevity the identification status of this model will not be proved here, since it is well known that regression models of this form are identified (Horwood, 1987).

4.3 DATA

Table 4.1 shows the matrix of correlations between measures of the exogenous variables and the eight split-half measures of self-esteem. The matrix suggests:

(i) Intelligence and teacher ratings of school performance have moderate, relatively consistent correlations with all SEI measures. These correlations range from 0.095 to 0.288 for intelligence, with a mean of 0.187. For school performance they range from 0.086 to 0.263 with a mean of 0.189. These figures convey the impression that there is a pervasive tendancy for reported self-esteem to increase with increasing intelligence and school performance.

Table 4.1: Correlations of Self-Esteem Measures and Predictor Variables

	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}
x_1	.119	.068	.197	.092	.094	.109	.096	.027	1.000																
x_2	.111	.069	.147	.099	.097	.136	.077	.088	.490	1.000															
x_3	.234	.288	.154	.193	.095	.193	.139	.199	-.187	-.214	1.000														
x_4	.207	.233	.245	.214	.086	.162	.120	.171	-.093	-.090	.552	1.000													
x_5	.219	.193	.236	.211	.135	.195	.112	.195	-.111	-.081	.512	.774	1.000												
x_6	.187	.204	.237	.206	.121	.190	.120	.177	-.114	-.108	.503	.793	.796	1.000											
x_7	.235	.256	.263	.210	.134	.234	.140	.212	-.106	-.127	.594	.718	.731	.742	1.000										
x_8	.134	.162	.108	.139	.015	.072	.118	.072	-.074	-.089	.255	.198	.179	.168	.182	1.000									
x_9	.181	.205	.138	.126	.076	.144	.104	.102	-.039	-.034	.316	.218	.185	.202	.226	.472	1.000								
x_{10}	.055	-.093	-.017	.012	-.031	.001	-.009	-.043	-.071	-.022	-.027	.158	.240	.224	.084	.054	.003	1.000							
x_{11}	.083	.104	.072	.035	.000	-.001	.077	.001	-.008	-.002	.176	.103	.057	.081	.102	.308	.292	-.012	1.000						
x_{12}	.089	.139	.058	.091	-.006	.044	.098	.106	-.090	-.125	.287	.237	.212	.204	.204	.370	.350	.032	.228	1.000					
x_{13}	-.062	-.055	-.054	-.074	-.084	-.018	-.002	-.089	-.003	.010	-.049	-.106	-.134	-.115	-.078	.042	-.063	.045	.401	-.111	1.000				
x_{14}	-.074	-.041	-.015	-.034	-.009	.005	-.042	-.007	-.010	.013	-.105	-.042	-.073	-.038	-.034	-.214	-.258	-.039	-.152	-.153	.047	1.000			
x_{15}	-.139	-.156	-.063	-.069	-.020	-.048	-.125	-.090	.028	.027	-.142	-.096	-.087	-.112	-.097	-.236	-.309	.057	-.321	-.223	-.014	.207	1.000		
x_{16}	-.130	-.108	-.085	-.060	-.022	-.047	-.085	-.045	.003	-.001	-.093	-.119	-.087	-.112	-.097	-.179	-.210	.032	-.350	-.129	-.141	.142	.501	1.000	
x_{17}	-.170	-.157	-.148	-.091	-.099	-.141	-.102	-.087	-.023	.045	-.128	-.127	-.124	-.134	-.147	-.112	-.189	.037	-.233	-.089	-.069	.015	.350	.496	1.000
S.D.	2.42	2.33	1.06	1.07	0.88	0.98	0.98	0.93	0.90	0.91	14.88	1.05	0.98	1.05	0.99	0.68	4.92	0.50	4.93	0.77	0.93	0.33	0.53	2.88	1.42

Notation: y_1 = General 1, y_2 = General 2, y_3 = Academic 1, y_4 = Academic 2, y_5 = Social 1, y_6 = Social 2, y_7 = Home 1, y_8 = Home 2, x_1 = Defensiveness 1, x_2 = Defensiveness 2, x_3 = IQ, x_4 = Reading, x_5 = Written Expression, x_6 = Spelling, x_7 = Mathematics, x_8 = SES, x_9 = Standard of Living, x_{10} = Gender, X_{11} = Maternal Age, x_{12} = Maternal Education, X_{13} = Birth Order, x_{14} = Ethnicity, x_{15} = Changes of Parents, x_{16} = Changes of Residence, x_{17} = Changes of School.

(ii) Family SES, standards of living, changes of parents, changes of residence and changes of school have somewhat lower but consistent correlations with self-esteem. Mean correlations for these variables are -0.073 for changes of residence, -0.089 for changes of parents, 0.103 for SES, -0.124 for changes of school and 0.135 for family living standards.

(iii) The remaining sociodemographic measures: gender, maternal age, maternal education, birth order and ethnicity are characterised by low, inconsistent correlations with self-esteem. The mean correlations (absolute values) for these variables range from 0.027 for ethnicity to 0.077 for maternal education.

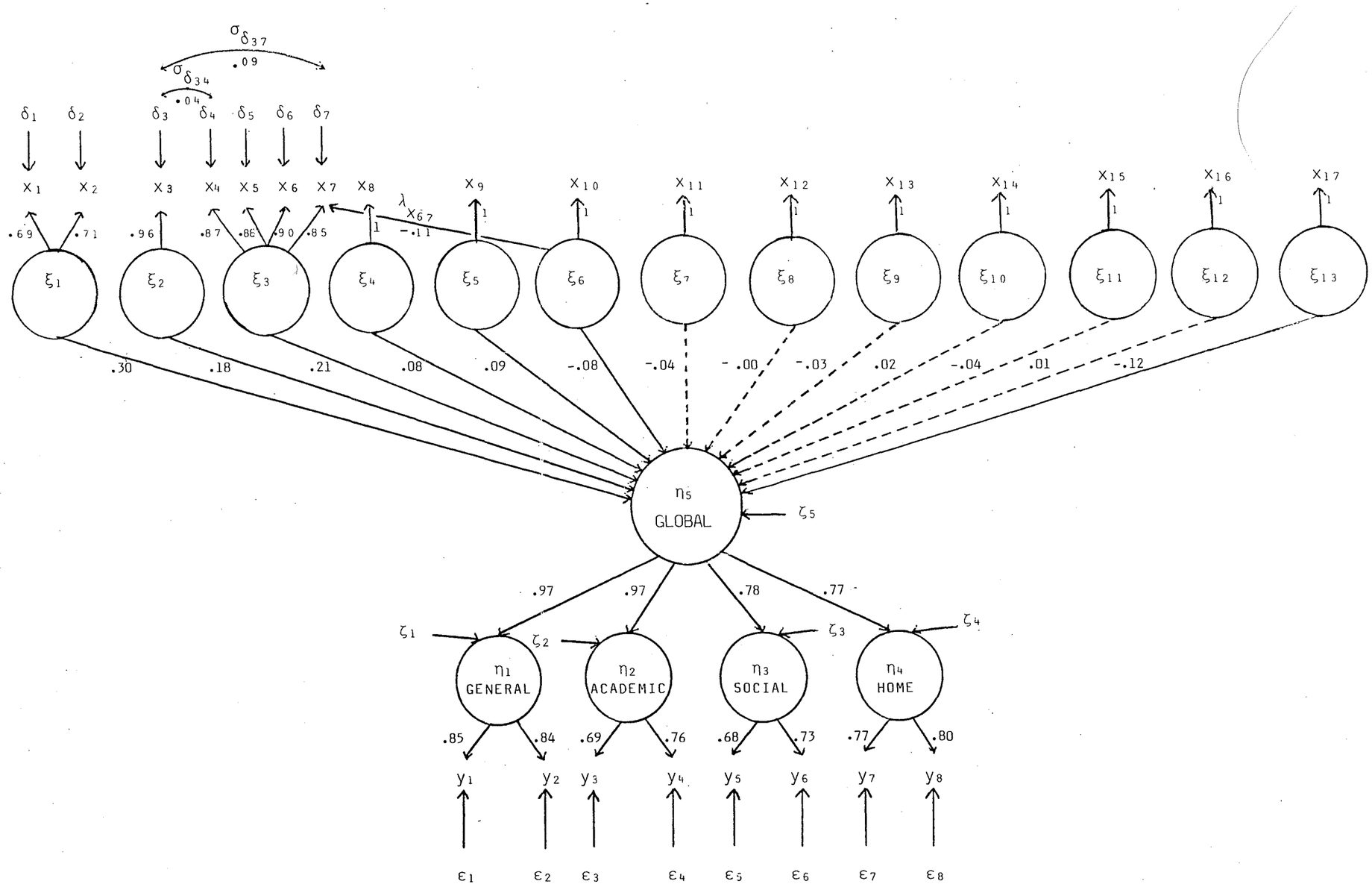
The regression model proposed makes the assumption that the exogenous variables are related to self-esteem in a linear fashion. It is therefore important to test the data for linearity before proceeding with any model analyses. The data relevant to this test are presented in Appendix III. It is clear from the Appendix that in the majority of cases there were no significant deviations from linearity. In three cases significant deviations ($p<.05$) were apparent. However, these deviations all occurred for only one of a pair of SEI indicators. It is therefore likely that these reflect idiosyncratic variability in the data rather than true non-linear trends. In light of this, it may be assumed that the exogenous variables are related to self-esteem in a linear fashion and it is possible to proceed with model analysis.

4.4 MODEL FITTING AND INTERPRETATION

The regression model specified in section 4.2 was fitted to the matrix of correlations presented in Table 4.1. The fitted model is shown in Figure 4.2. For simplicity, correlations between the exogenous variables are not represented in the figure. These correlations are listed separately in Table 4.2. In the fitted model the measure of intelligence (x_3) has been corrected for its known reliability (see Chapter 2; Table 2.5) by setting the disturbance variance equal to known test unreliability (or equivalently $\lambda x_{32} = \sqrt{.93}$). The four school performance measures (x_4, x_5, x_6, x_7) are represented as indicators of a general school performance construct (ξ_3). The coefficients (λx_{43}, λx_{53}, λx_{63}, λx_{73}) linking these measures to the general construct, range from 0.85 to 0.90 indicating that the measures are in fact strongly related to a common underlying school performance factor.

The fitted model in Figure 4.2 differs from the theoretical model shown in Figure 4.1 by the addition of three minor pathways ($\theta\delta_{34}$, $\theta\delta_{37}$, λx_{76}). Initial model analyses indicated that inclusion of these paths would result in a substantial improvement in model fit and that their inclusion was substantively justifiable (Long, 1983a). The parameters $\theta\delta_{34}$ and $\theta\delta_{37}$ represent correlated residuals between intelligence and performance in reading and mathematics. That is, the two performance measures share a source of common (error) variance with intelligence which is not accounted for by the latent structures in the model. The

FIGURE 4.2: Standardised Regression Model*



Notation: ξ_1 = Defensiveness, ξ_2 = Intelligence, ξ_3 = School Performance, ξ_4 = SES, ξ_5 = Standard of Living, ξ_6 = Gender, ξ_7 = Maternal Age, ξ_8 = Maternal Education, ξ_9 = Birth Order, ξ_{10} = Ethnicity, ξ_{11} = Changes of Parents, ξ_{12} = Changes of Residence, ξ_{13} = Changes of School.

* The regression pathways which failed to reach statistical significance are represented by broken lines.

Table 4.2: Correlations Between Exogenous Factors Estimated by Fitted Regression Model

	ξ_1	ξ_2	ξ_3	ξ_4	ξ_5	ξ_6	ξ_7	ξ_8	ξ_9	ξ_{10}	ξ_{11}	ξ_{12}	ξ_{13}
ξ_1	1.000												
ξ_2	-.293	1.000											
ξ_3	-.166	.602	1.000										
ξ_4	.118	.257	.207	1.000									
ξ_5	.052	.315	.233	.472	1.000								
ξ_6	-.062	-.014	.234	.054	.003	1.000							
ξ_7	-.007	.170	.095	.308	.292	-.012	1.000						
ξ_8	-.156	.293	.245	.370	.350	.032	.228	1.000					
ξ_9	.006	-.066	-.126	.042	-.063	.045	.401	-.111	1.000				
ξ_{10}	.004	-.115	-.056	-.214	-.258	-.039	-.152	-.153	.047	1.000			
ξ_{11}	.039	-.150	-.110	-.236	-.309	.057	-.321	-.223	-.014	.207	1.000		
ξ_{12}	.001	-.095	-.118	-.179	-.210	.032	-.350	-.129	-.141	.142	.501	1.000	
ξ_{13}	.021	-.128	-.148	-.112	-.189	.037	-.233	-.089	-.069	.015	.350	.496	1.000

Notation: ξ_1 = Defensiveness, ξ_2 = Intelligence, ξ_3 = School Performance, ξ_4 = SES, ξ_5 = Standards of Living, ξ_6 = Gender, ξ_7 = Maternal Age, ξ_8 = Maternal Education, ξ_9 = Birth Order, ξ_{10} = Ethnicity, ξ_{11} = Changes of Parents, ξ_{12}= Changes of Residence, ξ_{13} = Changes of School.

coefficient λx_{76} represents a gender effect on performance in mathematics. This coefficient reflects the fact that, in relation to their (superior) performance at school in general, girls tend to do less well at maths than boys. Although these additional parameters are small in size, their inclusion in the model resulted in a highly significant improvement in model fit (χ^2 = 60.50; df = 3, p<.0001; Long 1983a).

Table 4.3 summarizes the main results of the fitted regression model. The table presents the predicted correlations between each exogenous variable and global self-esteem, the standardised regression coefficients and tests of significance. The following conclusions may be drawn from these results.

(1) Defensiveness

The construct of defensiveness makes the largest single contribution to variations in global self-esteem with a regression coefficient of 0.30 (p<.001). This association is substantially larger than the effect estimated by the measurement model in Chapter 3 (from Table 3.3: β_{56} = 0.19, p<.001). Subsequent model analysis revealed that this discrepancy arose from the confounding effects of intelligence on the measures of self-esteem and defensiveness. The path diagram in Figure 4.3 summarizes the relatively complex relationships which exist between these factors. The figure shows that on the one hand, defensiveness has a positive effect (+0.30) on global self-esteem reflecting a tendency for reported self-esteem to increase with increasing defensiveness.

Table 4.3: Regression of Global Self-Esteem on Exogenous Factors

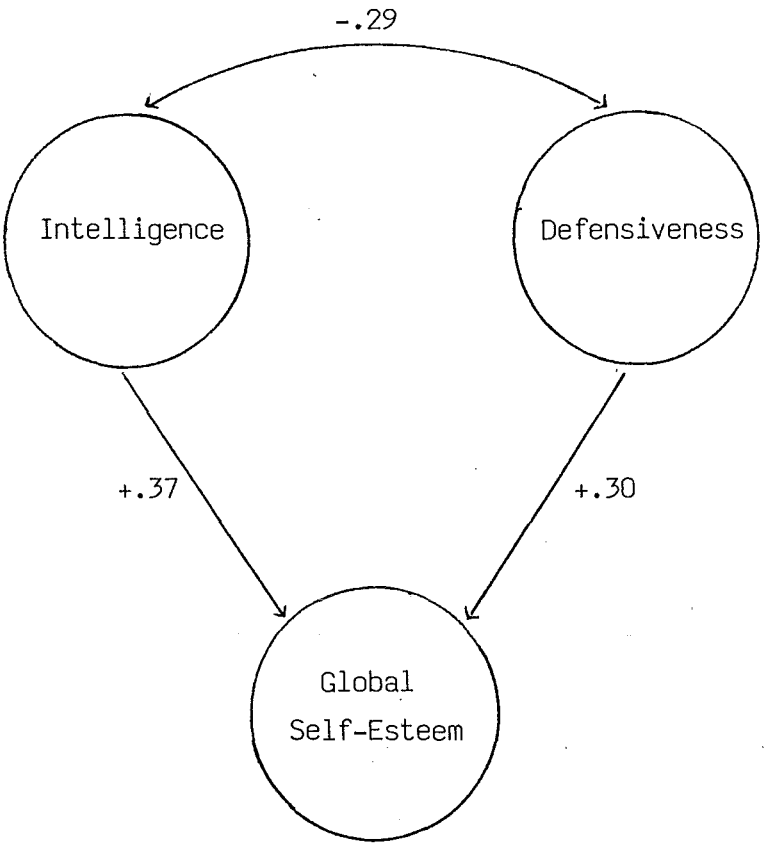
Predictor		r	γ	p<
Defensiveness	(ξ_1)	.201	.302	.001
Intelligence	(ξ_2)	.284	.182	.001
School Performance	(ξ_3)	.327	.214	.001
SES	(ξ_4)	.177	.082	.05
Standards of Living	(ξ_5)	.232	.086	.05
Gender	(ξ_6)	-.054	-.079	.05
Maternal Age	(ξ_7)	.086	-.035	NS
Maternal Education	(ξ_8)	.122	-.004	NS
Birth Order	(ξ_9)	-.077	-.029	NS
Ethnicity	(ξ_{10})	-.050	.023	NS
Changes of Parents	(ξ_{11})	-.148	-.042	NS
Changes of Residence	(ξ_{12})	-.123	.012	NS
Changes of School	(ξ_{13})	-.190	-.115	.005
Multiple Correlation		.492		

Notation: r = predicted correlation between global self-esteem (η_5) and explanatory variables (ξ_k)

γ = fitted regression coefficient for global self-esteem (η_5) on explanatory variables (ξ_k)

p = significance of regression coefficient, calculated using a t-test as outlined in Chapter 3 (3.3)

Figure 4.3: Regression of Global Self-Esteem on Intelligence and Defensiveness



At the same time defensiveness is negatively related (-0.29) to intelligence suggesting a tendency for children with low intelligence to respond more defensively. Since children of lower intelligence also have lower self-esteem (+0.37) the positive effects of defensiveness on self-esteem are partially counteracted by its negative association with intelligence ($r = 0.30 + (-0.29 \times 0.37) = 0.19$). Clearly, when the confounding effects of intelligence are not taken into account the relationship between self-esteem and defensiveness is markedly underestimated ($r = 0.19$). This exercise serves to emphasise the importance of going beyond simple bivariate analyses.

(2) Intelligence and School Performance

The factors of intelligence and school performance make the next largest independent contributions to variance in global self-esteem. The standardised regression coefficients are 0.21 ($p<.001$) for school performance and 0.18 ($p<.001$) for intelligence. These results indicate that global self-esteem increases with increasing intelligence and school performance, with each factor making an independent contribution.

(3) Sociodemographic Predictors

A large number of sociodemographic predictors are examined in the model. Of these, the number of changes of school experienced by the child, makes the largest independent contribution to variability in reported global self-esteem. The standardised regression coefficient for this variable ($\gamma_{13} = -0.12$, $p<.005$) indicates that frequent changes of school are associated with

lower levels of self-esteem. The regression coefficients for the measures of family SES (γ_4 = 0.08), family living standards (γ_5 = 0.09) and child's gender (γ_6 = -0.08) are just significant ($p<.05$). These results suggest that for this sample, children from advantaged homes report slightly higher levels of self-esteem than children from disadvantaged homes, and that girls have slightly lower self-esteem than boys. The independent contributions of the remaining sociodemographic predictors (maternal age, maternal education, birth order, ethnicity, changes of parents and changes of residence) are small (ranging from -0.035 to +0.042) and non significant.

4.5 GOODNESS OF FIT

(1) Overall Fit of Regression Model

It was noted in Chapter 3 (3.3) that it is advisable to assess model fit in a number of ways. Three tests of the overall fit of the regression model are outlined below.

(a) Log Likelihood Ratio Chi-Square Statistic (LRX^2). The LRX^2 statistic for the fitted regression model is 285.77 (df = 198; $p<.001$). This result implies the presence of a significant deviation between the fitted model and the data. However, given the large sample size employed, it may be more appropriate to examine the LRX^2 to df ratio as described in Chapter 3 (3.3). The ratio is 1.44 which indicates an acceptable fit of the model to the data (Schmitt, 1978).

(b) Residual Correlations. Table 4.4 presents residual correlations of the fitted model. These residuals represent the

Table 4.4: Residual Correlations of Self-Esteem Measures and Exogenous Variables

	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}
x_1	.004	-.045	.105	-.010	.020	.030	.014	-.059	-.000																
x_2	-.007	-.048	.052	-.006	.021	.055	-.008	-.000	.000	-.000															
x_3	.009	.066	-.027	-.007	-.049	.038	-.023	.031	.006	-.015	.014														
x_4	-.013	.011	.064	.014	-.058	.008	-.042	.003	.007	.013	.005	-.000													
x_5	-.006	-.032	.053	.009	-.011	.039	-.052	.025	-.010	.023	.003	.002	-.000												
x_6	-.046	-.026	.050	-.001	-.028	.030	-.047	.003	-.010	-.001	-.017	.004	-.003	-.000											
x_7	.011	.034	.082	.011	-.010	.080	-.021	.044	-.013	-.032	.014	-.003	.002	-.004	.000										
x_8	.012	-.018	.009	-.009	.079	.028	-.013	.037	-.007	.006	-.009	-.017	.004	.019	-.011	.000									
x_9	.011	-.015	.017	.045	.048	-.012	.034	.042	.003	-.003	-.015	-.014	.021	.009	-.027	.000	.000								
x_{10}	-.010	-.049	.019	.052	-.002	.032	.023	-.010	-.028	.022	-.014	-.046	.033	.013	-.001	.000	.000	.000							
x_{11}	.012	.034	.015	-.028	-.045	-.049	.026	-.052	-.003	.003	.013	.020	-.027	-.005	.020	.000	.000	.000	.000						
x_{12}	-.012	.039	-.023	.001	-.071	-.025	.025	.030	.018	-.014	.006	.023	-.005	-.018	-.001	.000	000	.000	.000	.000					
x_{13}	.002	.008	-.002	-.017	-.043	.026	.044	-.041	-.007	.006	.014	.004	-.023	-.001	.034	.000	.000	.000	.000	.000	.000				
x_{14}	-.033	-.001	.018	.002	.017	.033	-.013	.023	-.013	.010	.005	.007	-.024	.012	.009	.000	.000	.000	.000	.000	.000	.000			
x_{15}	-.016	-.035	.036	.040	.059	.036	-.037	.002	.001	-.001	.001	.000	.010	-.012	.003	.000	.000	.000	.000	.000	.000	.000	.000		
x_{16}	-.028	-.007	-.003	.031	.044	.023	-.012	.031	.002	-.002	-.002	-.016	.017	-.005	.007	.000	.000	.000	.000	.000	.000	.000	.000	.000	
x_{17}	-.013	-.002	-.021	.049	.002	-.033	.011	.031	-.038	.030	-.005	.003	.007	.000	-.016	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

Notation: y_1 = General 1, y_2 = General 2, y_3 = Academic 1, y_4 = Academic 2, y_5 = Social 1, y_6 = Social 2, y_7 = Home 1, y_8 = Home 2, x_1 = Defensiveness 1, x_2 = Defensiveness 2, x_3 = IQ, x_4 = Reading, x_5 = Written Expression, x_6 = Spelling, x_7 = Mathematics, x_8 = SES, x_9 = Standard of Living, x_{10} = Gender, X_{11} = Maternal Age, x_{12} = Maternal Education, X_{13} = Birth Order, x_{14} = Ethnicity, x_{15} = Changes of Parents, x_{16} = Changes of Residence, x_{17} = Changes of School.

discrepancy between the observed correlations and those predicted by the fitted model. The residuals range from -0.071 to +0.105 with a root mean square value of +0.024. Inspection of the residuals in relation to the observed correlations presented in Table 4.1 suggests an adequate fit of the model to the data.

(c) Goodness of Fit Index (GFI). The adjusted GFI for the fitted model is 0.92. Since values in excess of 0.90 are considered indicative of adequate fit (Joreskog & Sorbom, 1984), this statistic suggests an acceptable fit of the model to the data.

Collectively, these goodness of fit tests indicate that the regression model in Figure 4.2 provides an adequate account of the data.

(2) Modification Indices

The regression model in Figure 4.2 is based on the assumption that the exogenous variables (ξ_k) only influence global self-esteem (η_5) and have no direct effects on the specific self-esteem constructs (η_1 to η_4). The justification for this assumption may be assessed by examining the modification indices estimated by the fitted model.

A modification index is equal to the minimum expected decrease in the LRX^2 statistic if a single constraint in the model is relaxed (Long, 1983a). Long explains:

> If the value of the modication index for a parameter does not exceed 3.84 - the 0.05 critical value for a chi-square

> test with one degree of freedom - no appreciable gain in fit is likely to result from freeing the parameter. (1983a: 69)

Thus, if the modification indices between an exogenous variable (ξ_k) and both indicators of a specific self-esteem factor are found to exceed 3.84, this would imply that ξ_k has a direct effect on the specific factor over and above its direct effect on global self-esteem. In such cases an additional pathway linking ξ_k to the specific factor should be added to the model (if and only if, the inclusion of the pathway makes substantive sense (Long, 1983a)).

Table 4.5 shows the modification indices linking the exogenous variables (ξ_k) to the split half indicators of the specific self-esteem factors (η_1 to η_4). For simplicity, the exogenous variables which were not significantly related to global self-esteem have been excluded from the table. It is clear from the table that none of the exogenous variables are linked to <u>both</u> indicators of the specific self-esteem factors by statistically significant modification indices. While it is clear that several of the indices in the table exceed the 0.05 critical value of 3.84, the lack of any systematic results suggest that these indices may reflect idiosyncracies in the data or some imbalance in the formation of the split half indicator item sets. There is however, no evidence to suggest that the exogenous variables have a <u>consistent</u> direct effect on the specific self-esteem constructs. These results provide support for the prediction that the effects of the exogenous variables on reported self-esteem, are mediated via global self-esteem (η_5).

Table 4.5: Modification Indices Linking Significant Predictors to the Specific Self-Esteem Constructs

Specific Self-Esteem Construct	Split-Half Indicator	Modification Indices						
		ξ_1	ξ_2	ξ_3	ξ_4	ξ_5	ξ_6	ξ_{13}
η_1	y_1	0.26	0.37	1.36	0.23	0.00	0.04	0.68
	y_2	9.49*	7.10*	0.13	1.90	2.57	6.61*	0.01
η_2	y_3	12.55*	2.59	5.96*	0.04	0.01	0.36	1.16
	y_4	0.33	0.32	0.05	0.50	1.94	5.13*	4.63*
η_3	y_5	0.72	4.63*	2.33	5.73*	2.45	0.16	0.13
	y_6	1.22	2.12	2.96	0.02	1.43	1.40	1.63
η_4	y_7	0.62	2.59	4.15*	1.44	0.19	1.11	0.01
	y_8	2.20	1.87	1.85	2.42	0.74	0.54	1.02

* indicates modification index in excess of the 0.05 critical value

Notation: ξ_1 = Defensiveness; ξ_2 = Intelligence; ξ_3 = School Performance; ξ_4 = SES; ξ_5 = Standard of Living; ξ_6 = Gender; ξ_{13} = Changes of School; η_1 = General Self-Esteem with split half indicators y_1, y_2; η_2 = Academic Self-Esteem with split half indicators y_3, y_4; η_3 = Social Self-Esteem with split half indicators y_5, y_6; η_4 = Home Self-Esteem with split half indicators y_7, y_8.

4.6 CONCLUDING COMMENTS

The preceeding analysis has implications for two major issues pertaining to the relationship between SEI measures and external variables. These issues are discussed below.

(1) The Relationship Between External Factors and Measures of Global and Specific Self-Esteem

An important theoretical issue in self-esteem research is whether external factors influence self-esteem in general, or whether they influence only specific areas of self-esteem. Traditionally, this debate has focussed on the extent to which academic factors influence reports of general self-esteem and academic self-esteem. West, Fish & Stevens (1980) reviewed a large number of studies which have examined this issue. The results of these studies were generally consistent and provided support for the idea "that self-concept of academic ability is more highly .... related to achievement than general self-concept" (West, Fish & Stevens, 1980: 198).

The results of the present study are clearly not consistent with the majority of studies reviewed by these authors. The analysis showed that correlations between specific self-esteem measures and a wide range of explanatory variables could be adequately explained by the mediating effect of a global self-esteem construct. The model suggested that, for this sample of ten year old children, the external factors (including measures of cognitive ability and academic achievement) influenced the

children's level of self-esteem in general, rather than specific areas of self-esteem.

The discrepancy between these findings and the general results of previous studies may be explained in at least two ways.

(a) Age of Sample. The present study was confined to a relatively young sample (ten year olds) and it may be that the self-concept is relatively undifferentiated in young children (Marsh et al, 1984; Mullener & Laird, 1971; Coopersmith, 1967). For example, Shavelson, Hubner & Stanton suggest that:

> The self-concepts of young children are global, undifferentiated and situation specific .... With increasing age and experience (especially acquisition of verbal labels), self-concept becomes increasingly differentiated. As the child coordinates and integrates the parts of his self-concept, we can speak of a multifaceted, structured self-concept. (1976: 414)

If this theory holds true, then external factors which influence any one aspect of self-perception, are likely to influence the young child's overall self-perception. It is therefore possible, that the present lack of evidence to support an independent relationship between the predictor variables and the specific self-esteem constructs, may be attributable to the age of the sample. Unfortunately, West, Fish & Stevens (1980) did not indicate the ages of the subjects in the studies they reviewed, so it was not possible to determine whether our sample differed from these studies with respect to age.

(b) Differences in Analytical Methodology. Previous analyses of this issue have used relatively limited analytical techniques which have failed to take account of the effects of multiple

predictors and the effects of measurement error in both the self-esteem instrument and the predictor variables. It is possible that the failure to account for these factors has inflated the apparent relationship between the predictor variables and specific areas of self-esteem. Thus, analytic differences may account for the discrepancy between the present results and those of previous researchers.

Some support for this suggestion is provided by a confirmatory factor analysis conducted by Maruyama, Rubin & Kingsbury (1981). Using the SEI, these authors examined the relationships between self-esteem and multiple predictors (SES, ability and achievement) with self-esteem and the predictors corrected for measurement error. The results of their analysis were consistent with the present study. For a sample of twelve year old children, Maruyama, Rubin & Kingsbury found no evidence of an independent relationship between the specific self-esteem measures and the predictors. This would tend to suggest that the application of fairly simplistic analytical techniques to the study of self-esteem, may well produce misleading results.

(2) Factors Contributing to Variability in Self-Esteem

The regression analysis makes it possible to assess the relative contributions of a wide range of predictors to variability in self-esteem. The major conclusions which can be drawn from this analysis are summarized below.

(a) Defensiveness. Reviewers of the SEI scales have

generally cautioned researchers against the use of the defensiveness scale, claiming that the theoretical development of the scale is poor and that its interactions with self-esteem have not been established (e.g. Peterson & Austin, 1985). However, the regression analysis revealed that even when a wide range of variables were taken into account, defensiveness was the single strongest predictor of self-esteem. This indicates the presence of a relatively strong bias in the SEI. Defensiveness was also related to intelligence ($r = -0.29$), which suggests that defensive responding was more common in children of lower intelligence. The relatively strong effects of defensiveness on self-esteem, and its association with other predictor variables clearly indicates the importance of estimating the effects of defensiveness prior to any analysis of the relationships between self-esteem and other factors.

(b) Cognitive and Academic Factors. Aside from defensiveness, variables relating to the child's cognitive ability and school performance made the largest independent contributions to variability in SEI scores. In general, this finding suggests that for ten year olds, general intelligence and levels of academic achievement are important determinants of self-esteem. This result is probabily somewhat predictable given that a large amount of the life of a ten year old centres around school. Accordingly, it may be expected that success or failure in this environment would influence feelings of self-worth.

It should be noted that the regression model assumes a

unidirectional effect, with school performance and intelligence having a causal influence over esteem. However, the direction of causality between these factors has not been established conclusively. While previous research has tended to support the view that academic factors causally influence self-esteem (West, Fish & Stevens, 1980; Schierer & Kraut, 1979), the evidence is by no means clear cut (Marsh, 1987; Shavelson & Bolus, 1982). Unfortunately, there is insufficient data available in the present analysis to shed further light on this issue.

(c) Social Disadvantage. It has frequently been assumed that factors relating to social disadvantage have a profound effect on self-perceptions (Wells & Marwell, 1976). The results of the present study do not provide support for this view. While family socioeconomic status and family living standards were significantly related to self-esteem, the independent contributions of these factors were minor. Furthermore, despite the popular belief that Polynesian children have relatively low levels of self-esteem (Ranby, 1979) this analysis failed to find any difference between the self-esteem levels of the ethnic groups. These results are broadly consistent with previous SEI research (Chapman, 1984; Rubin, Dorle & Sandidge, 1977; Trowbridge, 1972). At best the results suggest that social background makes only a minor contribution to variability in self-esteem. Certainly there are no grounds for assuming that socially disadvantaged children have markedly lower self-esteem than their more advantaged peers. However, once again the age of the sample should be considered. It may be that the effects of social background become more

pronounced as children get older.

(d) Gender. The regression analysis suggests that girls tend to have slightly lower levels of self-esteem than boys. This result is not consistent with a large number of correlational studies which have failed to find evidence of gender differences on the SEI (see Chapter 1: Table 1.2). It is possible that this discrepancy can be attributed to the confounding effects of school performance. Since school performance is associated with higher self-esteeem ($\gamma = 0.21$) and girls tend to do better at school than boys ($r = 0.23$), it is likely that failure to take account of this factor would result in the gender differences on self-esteem being camouflaged. However, it should be noted, that while the gender difference is statistically significant, it makes only a minor contribution to variability in self-esteem. Certainly there is no evidence for this sample of substantial differences in self-esteem between the sexes.

(e) Childhood/Family Stability. Three measures which have been loosely grouped under the title of childhood/family stability were included in the regression model. While the number of changes of parents and changes of residence experienced by the child were not related to self-esteem, it was found that the number of changes of school had a small significant effect on self-esteem. Children who experienced frequent changes of school during their primary school years tended to have lower levels of self-esteem than children with more stable schooling backgrounds. The fact that this variable had a stronger effect than the measures of parental and residential stability, and that its effects persisted

when academic achievement was taken into account, suggests that the stability and consistency of the school environment may have some influence on children at this age. It is possible that continuity in the educational environment and its concommitant social environment are important factors in developing self-worth. Unfortunately there appears to be no previous research in this area. Thus, this conclusion should be regarded at best, as tentative and worthy of future research.

(f) Unexplained Variance. Probably the most important feature of the regression analysis is that despite the wide range of social and academic predictors examined, only a relatively small proportion of the variance in self-esteem was accounted for by the model. The multiple regression coefficient for the model was 0.492, which indicates that 24.2% of the variance in self-esteem was attributable to the predictor variables. Thus, a substantial proportion of variance, over three-quarters, could not be explained by the effects of the predictors. This suggests the presence of a non-observed factor, or factors, which independently of the predictors examined, exerts a profound effect on self-esteem.

There is little evidence in the self-esteem literature to suggest what these factors may be. A possible explanation could involve genetic or physiological factors pertaining to the individual's pychological makeup. Three lines of research which may provide tentative support for this suggestion are outlined below.

(i) There is clear evidence to suggest that self-esteem is strongly related to measures of anxiety (Kawash & Clewes, 1986; Richman, Brown & Clark, 1984; Kawash, 1982; Cowan, Altmann & Pysh, 1978; Smith, 1978; Edgar et al, 1974; Nicholls, 1967). These results have led some authors (Cowan, Altmann & Pysh, 1978) to suggest that the constructs of self-esteem and anxiety are in fact two opposing dimensions of a common underlying psychological trait.

(ii) There is evidence to suggest that self-esteem may be related to affective disorders such as depression (Chapman, Silva & Williams, 1984; Richman, Brown & Clark, 1984; Zemore & Bretell, 1983; Wilson & Krane, 1980). For example, a recent study found evidence of a strong relationship between self-esteem and the attributional styles which are commonly seen in depressed patients (Tennen & Herzberger, 1987). These results are consistent with cognitive theories of depression which implicate both anxiety and negative self-appraisals to the development of depression (Davison & Neale, 1982).

(iii) The evidence from family, twin and adoption studies provides support for the view that the predisposition for affective disorders (and logically, the predisposition for affective well-being) has a genetic basis (Davison & Neale, 1982). Thus it is possible that self-esteem is one (measureable) aspect of the individual's psychological makeup which may be at least partially genetically determined.

While prior evidence may support a genetic theory, it is

also possible that the unexplained variance in self-esteem reflects complex patterns of childhood socialization processes. The predictors which were considered by the regression model are relatively global or gross measures and as such, it may be that these measures fail to tap subtle underlying processes which determine self-esteem. For example, it has been suggested that parental child-rearing practices and parent-child relationships influence the development of self-esteem (Kawash & Clewes, 1986; Richman, Brown & Clark, 1984; Kawash, 1982; Coopersmith, 1967). In a review of educational intervention programmes, Schierer & Kraut (1979) conclude that variability in self-esteem may be a reflection of differing patterns within the child's network of primary affiliations.

These considerations make it clear that while a number of environmental factors may be identified which influence self-esteem, there is still a need to determine the complicated interactions which may exist between the genetic and environmental factors which influence the individual's evaluation of self-worth.

CHAPTER V

DISCUSSION AND CONCLUSIONS

5.1 INTRODUCTION

For several decades the concept of self-esteem has held an important role in sociological and psychological theory, and in recent years there has been a proliferation of empirically based studies of self-esteem. The emphasis which has been placed on this construct is clearly illustrated by Wells & Marwell's (1976) review of self-esteem research. The authors conclude:

> Self-esteem seems to us a vital and broadly relevant conceptual tool for both psychological and sociological perspectives. It has on occasion been overapplied, and there are clearly limits to the kinds of phenomena any concept can explain; however, how people think of and evaluate themselves .... is an essential behavioural construct for interpreting human conduct. Its interpretive importance is revealed not only by its frequency of occurrence in academic literature, but by the strength and variety of its applications in popular debates as well. Self-esteem seems to be emerging as one of the key 'social indicators' in current analyses of social growth and progress (1976: 250).

Despite these optimistic words the field of self-esteem research has been beset by a number of methodological problems, not least of which is the multitude and variety of self-esteem instruments in use. Reviewers have recommended that research should be limited to relatively small numbers of instruments, putting an end to the present proliferation of transient, untested measures (Wells & Marwell, 1976; Wylie, 1974; Crandall, 1973). For this reason the preceeding analysis utilized the Coopersmith

SEI (1981), a well-known and widely used measure of self-esteem, in order to examine several issues which have been the focus of previous research. Broadly, these issues concern the structure of self-esteem and the factors which influence or are influenced by self-esteem.

This chapter presents a discussion of the conclusions which may be drawn from the preceeding analysis of the self-esteem reports of over 800 ten year old New Zealand children. The analysis provided a comprehensive new approach to the assessment of the SEI, integrating four issues of interest. Firstly, it provided a method for testing a specific model of self-esteem, taking into account the effects of random errors of measurement. Secondly, it enabled estimation of the effects of a source of systematic bias in the SEI. Thirdly, the analysis provided the means for explicit testing of the relative importance of global versus specific measures of self-esteem, and fourthly, it enabled examination of the simultaneous effects of a number of possible predictors of self-esteem. Each of these four issues will be discussed below, taking account of the benefits and limitations of the structural equation methods employed and the contributions the analysis makes to the extant literature on self-esteem.

5.2 HIERARCHICAL FACTOR MODEL OF SELF-ESTEEM

Shavelson, Hubner & Stanton (1976) have suggested that self-esteem is a multifaceted construct. It is comprised of a

variety of specific self-evaluations pertaining to different aspects of the self and different areas of experience. The authors suggest that the self-concept is hierarchically structured on the dimension of generality, with specific areas of self-esteem at the base of the hierarchy and global self-esteem at the apex. The Coopersmith SEI school form was designed in accordance with this theory (Fleming & Courtney, 1984). The scale is comprised of four subscales to measure four specific areas of self-esteem, which can be summed to obtain a measure of global self-esteem. Using confirmatory factor analytic methods it was possible to test whether the SEI data collected from a large sample of ten year old New Zealand children was consistent with the hierarchical theory of the structure of self-esteem.

The analysis provided strong evidence to suggest that the SEI conforms to a general hierarchical model. It was possible to identify four first order factors which were consistent with the four subscales of the SEI. These factors were strongly correlated with an underlying second order factor, which it was assumed, represented global self-esteem. This model was able to reproduce the observed variance/covariance matrix with an acceptable degree of accuracy. The model suggests that by the age of ten years, the children in this sample were capable of constructing a sense of overall self-esteem which was dependent on, but detached from, more specific self-evaluations (Harter, 1983). These results provide further support to the existing evidence which favours an hierarchical interpretation of self-esteem (Marsh et al, 1984;

Marsh, Relich & Smith, 1983; Shavelson & Bolus, 1982).

However, the fact that the SEI data fit an hierarchical model does not necessarily prove that the structure of self-esteem is hierarchical. Rather, the analysis shows that the data are at least, consistent with an hierarchical interpretation. This does not preclude the possibility that other non-hierarchical models may provide a better account of this data. It was beyond the scope of the present study to examine this possibility.

One of the advantages of structural equation methodology lies in its ability to incorporate the concepts of reliability and validity within a specific model. The fitted hierarchical model provided estimates of reliability and internal construct validity for the SEI. This was achieved by partitioning the observed variance in the SEI scores (Chapter 3: Table 3.2). It was found that the observed measures were only moderately reliable since a substantial proportion (28% to 54%) of between-subject variance was random variance, attributable to non-systematic measurement error. However, the measures were modestly internally valid. When the effects of one source of systematic bias were taken into account, it was found that between 45% and 70% of the observed variance in the indicators was systematic construct-relevant variance. By incorporating the concepts of reliability and validity into the self-esteem model it was possible to estimate the relationship between self-esteem and other variables of interest, with self-esteem corrected for these sources of error. This approach is clearly superior to more traditional methods of analysis which

provide correlational data based on fallible indicators.

5.3 THE EFFECTS OF SYSTEMATIC BIAS

An ongoing concern in the literature is the extent to which self-esteem measures are contaminated by systematic errors of measurement arising from response biases (Wells & Marwell, 1976; Wylie, 1974). to overcome this problem Coopersmith developed the defensiveness scale which was designed to measure the degree to which a subject was being honest and forthright in his or her self-appraisal (Coopersmith, 1981). Unfortunately, Coopersmith failed to elaborate on how defensiveness scores could be used to detect measurement error in the SEI or how SEI scores could be corrected to take account of this source of bias (Peterson & Austin, 1985).

The present analysis suggests a possible solution to this problem. The observed defensiveness measures were used as fallible indicators of a source of systematic bias in responding to self-esteem items. A multiple regression coefficient of +0.30 was obtained linking the factor of defensiveness to global self-esteem. This result suggests the presence of a substantial bias in the observed self-esteem scores. It was possible, using confirmatory factor analytic methods, to assess the extent of contamination caused by defensiveness, and to correct for this when self-esteem was examined in relation to other measures.

An interesting result which emerged from the analysis was that defensiveness was found to be correlated with other measures. Notably, defensiveness was negatively correlated with intelligence ($r = -0.29$). It was shown that these two factors interacted with the reporting of self-esteem in a complex manner (see Chapter 4: 4.4). When the effects of intelligence and defensiveness were not assessed jointly, the relationship between intelligence and self-esteem was grossly overestimated ($r = +0.37$ instead of $\gamma = +0.18$) and the relationship between defensiveness and self-esteem was underestimated ($r = -0.19$ instead of $\gamma = -0.30$). This result serves to illustrate the importance of establishing and accounting for sources of systematic variance when self-esteem is examined in relation to other measures.

The implications for future research are clear. Firstly, the present study suggests that it is essential to consider the role of defensiveness in any analysis of the SEI, and especially when self-esteem is examined in relation to intelligence and cognitive ability. Secondly, there is a need for the construct of defensiveness to be more clearly defined. Coopersmith (1981) refers to the defensiveness scale as a measure of 'defensiveness', 'test-wiseness' and 'lying', terms which have widely differing interpretations. This would seem to imply that Coopersmith himself is unsure what this scale measures, and inspection of the scale items (see Appendix II.1) sheds little light on the issue. Given the important influence of this measure on self-esteem reports, further investigation of this issue would seem warranted.

The third implication concerns the possibility that there are other sources of contamination which influence self-esteem reports. While it was suggested earlier that in the region of 45% to 70% of the variance in the self-esteem indicators was systematic construct-relevant variance, it may be that a portion of this reflects systematic bias arising from factors other than defensiveness. For example, the evidence of a substantial relationship between children's reports of self-esteem and social desirability measures (Cowan, Altmann & Pysh, 1978; Crandall, 1973) has led some authors to question the construct validity of the SEI (Cowan, Altmann & Pysh, 1978). While it was beyond the scope of the present study to examine this relationship, it is clearly important for future research to explore the possible contaminating role of social desirability and other factors.

5.4 GLOBAL VS SPECIFIC FACTORS OF SELF-ESTEEM

The idea that the self-concept is a multi-dimensional construct can be traced to the early work of James (1890) and Cooley (1902). These authors suggested that a relatively stable, global mental picture of the self exists in conjunction with a number of discreet, less stable, specific self-evaluations. Traditionally self-esteem research has emphasised the global aspect of self-esteem, attributing only minor roles to the specific dimensions (Harter, 1983). In recent years a number of studies have examined the specific facets of self-esteem. This research has been based on the theory that the self-concept cannot be adequately understood if its multi-dimensionality is

ignored (Marsh & Shavelson, 1985). The results of these studies have tended to suggest that the specific facets are better predictors of a number of external measures than global self-esteem (West, Fish & Stevens, 1980).

The present analysis adopted the traditional approach to this issue. It was assumed that the relationships between external variables and the specific dimensions of self-esteem could be adequately explained by the mediating role of global self-esteem. It was shown in Chapter 4 (4.5) that this assumption was justified. Indices of model fit suggested that external factors influenced overall self-esteem rather than directly influencing the specific areas of self-esteem. This suggests that while ten year old children make distinctions about their worthiness in different areas of experience, these distinctions are made within the context of their established, overall appraisal of worthiness (Coopersmith, 1967). Maruyama, Rubin & Kingsbury (1981) reached the same conclusion for a sample of twelve year olds based on a similar confirmatory factor model of the SEI.

However, a number of previous studies reviewed by West, Fish & Stevens (1980) have found support for the opposing view: that the specific self-esteem factors are directly related to external measures. It has been suggested (Chapter 4: 4.6) that there are at least two possible explanations for this discrepancy. Firstly, it is likely that the self-concept becomes increasingly

differentiated with age (Marsh et al, 1984; Shavelson, Hubner & Stanton, 1976; Mullener & Laird, 1971; Coopersmith, 1967) and it is possible that for the present sample of ten year old children, the self-concept was relatively undifferentiated. Alternatively, the apparent discrepancy may have arisen from differences in analytical techniques. It is possible that a failure to account for random and systematic errors, and the use of bivariate rather than multivariate methods could have led previous researchers to overestimate the importance of the specific self-esteem factors.

5.5 RELATIVE CONTRIBUTIONS OF EXPLANATORY VARIABLES

The literature on self-esteem has been dominated by empirical studies of the relationship between self-esteem and a variety of other measures. However, this body of research has a number of limitations. Firstly, in general, these studies have failed to account for the reliability and validity of the self-esteem measures employed, and secondly, the studies have tended to use bivariate rather then multivariate methods of analysis. The present study has illustrated how both of these problems can be overcome. It was possible, using structural equation modelling methods to estimate the relative contributions of a wide range of social and cognitive variables to self-esteem, taking into account the effects of random errors of measurement and a source of systematic error. The analysis provided a number of informative results, the implications of which are discussed

below.

(1) Measures of Social Disadvantage

Using multiple regression techniques it was possible to examine the relationships between self-esteem and a large number of socio-demographic predictors. The analysis revealed the presence of a small positive association ($p<.05$) between self-esteem and measures of family SES ($\gamma = +0.08$) and family living standards ($\gamma = +0.09$). These results are consistent with some previous studies which have also found evidence that children with higher self-esteem come from more privileged backgrounds (Demo & Savin-Williams, 1983; Maruyama, Rubin & Kingsbury, 1981; Rubin, Dorle & Sandidge, 1977). However, other studies have produced conflicting results: some have found no evidence of a relationship between these measures (Coopersmith, 1967), and at least two studies have found evidence of a negative relationship between self-esteem and socio-economic status (Reed, 1972 (cited in Coopersmith, 1981); Trowbridge, 1972). Collectively, the evidence is inconclusive. While the present study suggests the presence of a weak positive relationship between self-esteem, SES and family living standards, the evidence is not strong enough to support the popular view that social disadvantage per se is a major factor determining self-esteem.

Self-esteem was also examined in relation to a number of other background measures. The analysis suggests that self-esteem is not associated ($p>.05$) with measures of maternal age,

maternal education, birth order, family stability and residential stability. These results are hardly surprising. There was no prior evidence to suggest that maternal age and education levels would independently influence self-esteem, and a recent multivariate analysis (Song & Hattie, 1984) has supported Coopersmith's (1967) conclusion that family size and ordinal position are largely unrelated to self-esteem. Coopersmith (1967) found evidence of a small positive relationship between self-esteem and measures of family breakdown and parental changes, but this has not been supported by subsequent research (Smiley, Chamberlain & Dalgleish, 1983).

A possible explanation for the failure of the present study to find strong links between self-esteem and measures of social disadvantage and family background may lie in the types of social and family measures employed. The measures used in this study were fairly gross, general measures and it is possible that self-esteem could be more strongly related to more sensitive measures. Consider for example, family background: Coopersmith (1967) has conducted some research in this area, looking mainly at parent-child relationships. He concludes that three conditions foster self-esteem:

> total or near total acceptance of the children by their parents, clearly defined and enforced limits, and the respect and latitude for individual action that exist within the defined limits (1967: 236).

Thus, while the present study found that general measures of family background and social disadvantage were not major

determinants of self-esteem, it is possible that future research may reveal that more subtle measures of family dynamics and social interaction determine self-esteem.

(2) Ethnicity

The present study also suggested that ethnicity was not related to self-esteem ($p>.05$). In contrast Ranby (1979) reported that Maori children scored lower on a modified version of the SEI than Pakeha children; a relationship which persisted when age, gender, SES and other factors were taken into account. Ranby suggests that ethnic differences in self-esteem are a major factor contributing to the poor academic achievement of Maori children. He concludes that

> When a satisfactory self-concept founded on ethnic identity has been achieved, Maori children, it is hoped, will achieve more highly on all school subjects .... (1979: 66).

However, Ranby's results should be approached with caution for a number of reasons. Firstly, it was shown in Chapter 1 (1.4) that studies using modified versions of the SEI often produce results which are inconsistent with the general body of SEI research (e.g. Gibbs & Norwich, 1985; Williams, 1973). Secondly, Chapman (1984) has criticised Ranby for poor methodology and for confusing statistical significance with meaningful results. Moreover, Chapman himself failed to find evidence of Maori/Pakeha differences using an alternative measure of self-concept. Collectively, the evidence tends to suggest that there are no appreciable differences in the self-concept of Maori and Pakeha children.

This conclusion has a number of implications because, as Ranby notes,

> The majority of academics and educators .... and a proportion of Maori parents share a strong conviction that the average Maori child lacks a sense of ethnic identity and a sense of self. (1979: 65)

This 'common lore' (Chapman, 1984) has been widely applied by educationalists, politicians and others. For example the National Advisory Committee on Maori Education (NACME) suggests that enhancing the self-concept of Maori children will enable them "to realise their full potential, first of all within the school system and later as effective members of the community" (1970: 3). In a similar manner Peter Tapsell, M.P. for the Eastern Maori Electorate, has forwarded the view that the development of self-esteem in Maori children would result in a sense of pride. This pride, he claims

> .... would lead to greater scholastic effort, to greater attention to even the simplest things like dress, like stance, like nutrition - everything. The young person with a sense of pride, of identity, with the feeling that he represents a contribution to our world that is respected: - that's the person who is bright, who is alert, who stands upright, who polishes his shoes and feels part of the scene. The child who has been made to feel .... that his contribution and that of his people are barely worth considering - he is down at heel, he can't be bothered with his dress, he is not alert - he fails. (Interview with O'Regan, 1983: 24).

Unfortunately the empirical evidence from this study and from Chapman's (1984) study do not support these claims. The failure to find appreciable ethnic differences on measures of self-esteem suggests that the social and educational disadvantage of the Maori people can not be accounted for solely in terms of a supposed lack of self-esteem. Thus, it would appear that programs

designed to improve the lot of the Maori people by enhancing their self-esteem, have little chance of success.

There remains the possibility, however, that traditional measures such as the SEI fail to tap essential elements of the self-concept which do reflect ethnic differences. For example, Tapsell (O'Regan, 1983), Ranby (1979) and the NACME report (1970) all refer to racial pride and the sense of 'Maoriness'. It is possible that if these aspects of the self-concept are examined, ethnic differences may exist, and attempts to enhance these areas could lead to improvements in the social and educational circumstances of the Maori people. Certainly this is an area worthy of future research.

(3) Gender

A large number of studies have examined SEI scores for possible gender differences (see Chapter 1: Table 1.2). These studies have consistently found no evidence to suggest that boys and girls evaluate themselves differently. Wylie (1979) has criticised this research. She notes that while the correlational evidence suggests that boys and girls do not differ in their overall self-evaluations, it does not reveal whether there are systematic differences between the sexes on different aspects of the self-concept. The present analysis sheds light on this issue. The multiple regression analysis revealed the presence of a small gender effect on global self-esteem ($\gamma = -0.08$; $p<.05$). It was found that when the confounding effects of school performance were

taken into account, girls tended to have slightly lower levels of self-esteem than boys. Examination of the modification indices for the fitted model suggested that gender was not directly related to any of the specific self-esteem factors. That is, the observed gender effect persisted across all aspects of the self-concept.

It should be noted that the observed gender effect was small. It would be incorrect to conclude from this result that there are marked self-esteem differences for the boys and girls in this sample. However, the result serves to emphasise the importance of conducting multivariate analyses, and it highlights the benefits of structural equation modelling methods when applied to self-esteem research.

(4) Cognitive and Academic Factors

Self-esteem has long been regarded as a major factor determining academic achievement. This view is illustrated by the following exerpts from the psychological and educational literature.

> Self-esteem is not something separate from school performance in reading, math, and social and physical skills. It is an important, integral part of performance. (Coopersmith, 1981: 1).

> [The research evidence] .... gives us reason to assume that enhancing the self-concept is a vital influence in improving academic performance. (New Zealand Committee on Health & Social Education, 1977: 14).

> It may well be that a positive conception of one's self as a person is not only more important than striving to get ahead and enthusiasm for studying and going to school, but

> that it is a central factor when considering optimal scholatistic performance. (Irwin, 1967: 271).
>
> Academic success or failure appears to be as deeply rooted in concepts of the self as it is in measured mental ability, if not deeper. [It may be] .... that the assumption that human ability is the most important factor in achievement is questionable, and that the student's attitudes limit the level of his achievement in school. (Purkey, 1970: 14)

The results of the present analysis do not appear to substantiate the emphatic views of these authors. While the present analysis showed that self-esteem was significantly related ($p<.001$) to measures of cognitive ability and school performance, the relationship was, at best, only a modest one. The regression coefficients were $\gamma = +0.18$ for intelligence and $\gamma = +0.21$ for school performance. It is not possible to conclude from these figures that self-esteem has a <u>vital</u> influence on ability and performance.

Defensiveness appears to play an important role in this relationship. It was suggested that when the confounding effects of defensiveness were not taken into account, the relationships between self-esteem and the cognitive factors were overestimated. This may explain the apparent discrepancy between the present results and the conclusions of other researchers. A failure to account for defensiveness, and an abundance of bivariate rather than multivariate analyses, may have led educators to overestimate the importance of self-esteem on academic factors. This, in turn, would explain why educational intervention programs designed to improve achievement by enhancing self-esteem, have generally had

poor results (Schierer & Kraut, 1979).

An alternative explanation for the relatively small relationships found in the present analysis, may lie in the type of self-esteem measure employed. Evidence from previous studies suggests that cognitive variables are more strongly related to measures of academic self-esteem than to measures of global self-esteem (West, Fish & Stevens, 1980). However the evidence is not entirely convincing. Firstly, the present study indicates that the academic self-esteem factor was not significantly related to cognitive measures, independently of global self-esteem. This result is substantiated by the earlier work of Maruyama, Rubin & Kingsbury (1981) with the SEI. Secondly, it is possible to question the content validity of a number of the academic self-concept instruments used in the past. For example, the academic subscales of the Self Description Questionnaire (Marsh, Relich & Smith, 1983) include items such as:

I am good at reading

I am dumb at all my school subjects

I get good marks in math

It is likely that these items measure the students' perceptions of their ability and performance, and logically, these should be closely related to the students' actual abilities and performance. It is questionable whether such items should be regarded as indices of self-esteem. Clearly, academic self-concept scales need further careful investigation in order to clarify the question of content validity.

It has been argued here that the relationship between self-esteem and academic/cognitive factors is not as strong as many people would like to believe. However, the fact remains that for the present analysis, the academic variables were better predictors of self-esteem than measures of family and social background. It was also found that low self-esteem was related to school stability ($\gamma = -0.12$; $p<.005$), but was not related to either family or residential stability. These results suggest that for this sample of ten year old New Zealand children, the educational environment exerts an important influence on the development of self-esteem.

(5) Unexplained Variance

The present study examined the relationship between self-esteem and a large number of exogenous variables. The multiple correlation coefficient for the model ($r = 0.49$) revealed that these variables accounted for less than a quarter of the variance in global self-esteem. Thus, while it was possible to identify a number of factors which influenced self-esteem, it is likely that the primary determinants of this construct were not examined. There are at least two possible approaches to the unexplained variance question.

Firstly, the measures employed in the present study are fairly gross, general measures. It is possible that self-esteem is related to more subtle aspects of the child's environment. For example, there is evidence to suggest that self-esteem is related to specific aspects of parent-child relationships and to

peer-approval (Hales, 1979a, 1979b; Kokenes, 1978; Coopersmith, 1967). Thus, it is possible that self-esteem is partly determined by 'significant others' whose relative importance to the child may vary with age.

An alternative explanation is that self-esteem is largely predetermined by genetic or physiological factors. This suggestion is based on studies which link low self-esteem to anxiety and depression (Kawash & Clewes, 1986; Chapman, Silva & Williams, 1984; Richman, Brown & Clark, 1984; Zemore & Bretell, 1983; Wilson & Krane, 1980; Cowan, Altmann & Pysh, 1978). Since affective disorders may have a genetic basis, it is also possible that people are predisposed toward forming specific types of self-evaluations. At the present time, it is uncertain which, if either, of these lines of research is most likely to contribute to our knowledge of self-esteem. Certainly, further research in these areas seems warranted.

5.6 CONCLUSIONS

The present study examined self-esteem for a large sample of ten year old New Zealand children using the Coopersmith SEI. The structure of the SEI and its relationships to a number of social, cognitive and family background measures were assessed using structural equation models and confirmatory factor analysis. The following list summarises the major findings of the study:

(i) The structure of the SEI is consistent with an

hierarchical factor model.

(ii) The self-esteem indicators were relatively fallible measures, contaminated by both random errors of measurement (unreliability) and systematic errors of measurement arising from defensiveness (invalidity).

(iii) The relationships between self-esteem and cognitive/academic variables were confounded by the contaminating effects of defensiveness.

(iv) The specific factors of self-esteem were related to exogenous variables via the mediating factor of global self-esteem.

(v) Measures of intelligence, school performance, school stability, and to a lesser extent, gender, family SES and family living standards made small significant contributions to variability in self-esteem. Other measures, including ethnicity and family breakdown had no direct effects on self-esteem.

(vi) These measures accounted for less than a quarter of the variance in global self-esteem, suggesting that the primary determinants of self-esteem were not examined in this analysis.

These results have a number of implications for the direction of future research. Firstly, one of the major problems with self-esteem research is the diversity of instruments in use. Wylie (1974) notes that despite the great amount of effort expended on self-esteem research, this effort has been scattered much too widely and much too thinly. New measures are being continually developed, many of which will only be used once or twice. The

result is that most of these measures are of an unknown quality, as is the body of research findings based on their use (Wells & Marwell, 1976). There is a clear need for researchers to limit themselves to a small number of scales. This will enable the gradual accumulation of validity data, providing a sound basis for the interpretation and assimilation of new findings (Crandall, 1973). Only through the careful investigation of established measures such as the SEI, will we be able to expand our knowledge of self-esteem, its properties and its relationships with other measures.

A second requirement is the need for self-esteem researchers to give more careful consideration to the statistical techniques they employ. While it is widely recognised that research results are only as good as the instruments employed, it is often forgotten that they are also only as good as the methods of analysis employed. Self-esteem research to date has been dominated by relatively simplistic methods of analysis. A number of recent studies (e.g. Newman, 1984; Shavelson & Bolus, 1982; Maruyama, Rubin & Kingsbury, 1981) have applied confirmatory factor analytic techniques to self-esteem data with promising results. The benefits of such methods have been illustrated by the present study. Most importantly, confirmatory factor models are substantively generated, they can incorporate the concepts of measurement reliability and validity, and direct tests of how well the model explains the data are possible (Long, 1983a, 1983b). There is a clear need for social scientists to recognise the essential role of statistical

tools and the contributions these tools make to their research.

The present study also suggests the need for self-esteem researchers to broaden their areas of investigation. Recent studies have tended to concentrate on the interaction of self-esteem and cognitive variables (e.g. Marsh, 1987; Marsh, Parker & Barnes, 1985; Song & Hattie, 1985; Newman, 1984; Chapman, Silva & Williams, 1984). While there is an important association between these factors, the results of the present study suggest that other more important determinants of self-esteem may be being overlooked. Moreover, there is a paucity of studies examining the behavioural correlates of self-esteem and the possible influence of the family (Harter, 1983; Wylie, 1979). It has been suggested that childhood socialization processes and the relationship between self-esteem and measures of anxiety and depression, are areas worthy of future investigation.

Finally, it is recommended that researchers should concern themselves with longitudinal studies. A number of longitudinal analyses have been conducted (e.g. Newman, 1984; Maruyama, Rubin & Kingsbury, 1981; Bachman & O'Malley, 1977; Calsyn & Kenny, 1977), but once again, these authors have tended to concentrate on the academic-esteem relationship. Harter (1983) notes that there are a number of possible developmental influences on self-esteem, and our knowledge of this construct may expand appreciably if a developmental approach is adopted. More insight may be gained from examining patterns of changes in self-esteem, than from

analysing cross-sectional data.

The Christchurch Child Development Study is currently conducting research based on these recommendations. The present study represents an analysis of the first wave of self-esteem data collected by the Christchurch Child Development Study. Subsequent analyses will be conducted as longitudinal data is collected, and the data base is being expanded to examine behavioural measures and the effects of the changing roles of the family and the school on the development of self-esteem.

In conclusion, the analysis makes clear some of the difficulties which may arise in the construction of measures of abstract psychological constructs. The SEI was constructed and validated largely on the basis of intuitive ideas about the concept of self-esteem, supplemented by relatively limited methods for assessing test reliability and validity. While this process is useful in the preliminary stages of test construction, it also invites possible imprecisions and lack of clarity about the underlying structure of the measure. The major aim of this thesis has been to illustrate the way in which the application of methods of confirmatory factor analysis may serve the dual role of both clarifying the linkages between the observed test items and the latent structure of the test, and of providing an explicit basis for assessing test reliability and validity.

It is clear that the conclusions produced from this approach

differ somewhat from those based on less searching methods of analysis. On the basis of results derived from explanatory factor analyses or other traditional methods of analysis, most authors have been prepared to claim that the SEI is a valid and reliable measure of self-esteem (e.g. Peterson & Austin, 1985; Adair, 1984; Crandall, 1973). However, others have been more critical, to the point of suggesting that the SEI is moribund as a measure of self-esteem (Sewell, 1985; Wylie, 1974). The results of the present analysis suggest conclusions which lie between these extremes. While it is the case that the SEI appears to contain reliable and valid variance describing variations in childhood self-esteem, it also contains substantial random and systematic error variance. The test is thus neither totally reliable and valid, nor is it totally unreliable and invalid.

These considerations suggest the need for test constructors and others to shift their concerns away from whether or not measures are reliable and valid, towards an approach which recognises that such measures will contain both sources of construct-relevant variance and sources of error. Clearly, the essential problem is that of separating the useful test variance from the variance which reflects unreliability and invalidity. In this respect, the comments of Duncan appear to be relevant:

> A mature science, with respect to the matter of errors in variables, is not one that measures its variables without error, for this is impossible. It is, rather, a science which properly manages its errors, controlling their magnitudes and correctly calculating their implications for substantive conclusions. (1975: 114).

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APPENDIX I

IDENTIFICATION

This appendix assesses the identification status of the model outlined in Chapter 1 (see Figure 1.4). A model is identified if all the parameters in the model can be specified by a unique set of values (Joreskog & Sorbom, 1984). It is necessary to establish the identification status of a model before any attempts are made to estimate the model parameters since "attempts to estimate models that are not identified result in arbitrary estimates of the parameters and meaningless interpretations" (Long, 1983a: 35). To establish that a model is identified it is necessary to prove that sufficient information can be obtained from the observed variables to define the model parameters. The most direct approach is to demonstrate that each of the model parameters can be expressed in terms of the variances and covariances of the observed variables (Long, 1983a).

To establish the identification status of the hierarchical factor model of self-esteem outlined in Chapter 1 (1.5) consider the case in which all variables both latent and observed, are assumed to be standardised with a mean of zero and variance of one. In the standardised model there are 30 unknown parameters. These are:

(i) The ten coefficients λy_1, λy_2, λy_3, λy_4, λy_5, λy_6, λy_7, λy_8, λy_9, λy_{10}.

(ii) The ten error variances Θ_{ε_1}, Θ_{ε_2}, Θ_{ε_3}, Θ_{ε_4}, Θ_{ε_5}, Θ_{ε_6}, Θ_{ε_7}, Θ_{ε_8}, Θ_{ε_9}, $\Theta_{\varepsilon_{10}}$.

(iii) The five coefficients β_{15}, β_{25}, β_{35}, β_{45}, β_{56}.

(iv) The five disturbance terms' variances ψ_{11}, ψ_{22}, ψ_{33}, ψ_{44}, ψ_{55}.

Identification of this model may be established in two stages.

(1) Hierarchical Component

Consider first the hierarchical component of the model linking the observed variables y_1, y_2, y_3, y_4, y_5, y_6, y_7, y_8, to the underlying constructs η_1, η_2, η_3, η_4, η_5. This component of the model has the form of an hierarchical true score model. For a model of this form it is possible to establish the following set of sufficient conditions for identification (Horwood, 1987):

(i) The parameters λ_{yi} and $\Theta_{\varepsilon i}$ (i = 1 to 8) are identified if there exists at least two latent constructs η_j with at least two indicators per construct, and the covariances of the latent constructs are non-zero.

(ii) The parameters β_{j5} and ψ_{jj} (j = 1, 2, 3, 4,) are identified if there are at least three indicators η_j of the global construct η_5. Both of these conditions are satisfied by the model and hence the parameters:

λ_{y_1}, λ_{y_2}, λ_{y_3}, λ_{y_4}, λ_{y_5}, λ_{y_6}, λ_{y_7}, λ_{y_8};

Θ_{ε_1}, Θ_{ε_2}, Θ_{ε_3}, Θ_{ε_4}, Θ_{ε_5}, Θ_{ε_6}, Θ_{ε_7}, Θ_{ε_8};

β_{15}, β_{25}, β_{35}, β_{45} are identified.

By definition, $\psi_{jj} = 1 - \beta_{j5}^2$ for the standardised model. It follows that if β_{15}, β_{25}, β_{35}, β_{45} are identified, then ψ_{11}, ψ_{22}, ψ_{33} and

ψ_{44} are also identified.

(2) Defensiveness Component

It is now possible to examine the identification status of the unknown parameters in the defensiveness component of the model. These parameters are:

(i) the three coefficients λ_{y_9}, $\lambda_{y_{10}}$, β_{56}

(ii) the three variances Θ_{ε_9}, $\Theta_{\varepsilon_{10}}$, ψ_{55}.

There are two methods by which the identifiability of these parameters may be established:

(i) by expressing the parameters in terms of the variances and covariances of the observed variables

(ii) by expressing the parameters in terms of the variables whose identification status has already been established in the first (hierarchical component) section of this proof.

For mathematical simplicity of presentation, a mixture of both of these methods will be employed.

Let σ_{ij} denote the covariance of the observed variables y_i, y_j. The identifiability of the unknown parameters in the defensiveness component of the model, may be established by considering the set of six variance and covariance equations linking y_9 and y_{10} with any other y_i ($i = 1$ to 8) variable in the model. For example, consider the variables y_1, y_9, y_{10}. It is known from the model specifications outlined in Chapter 1 (1.5) that:

$$y_1 = \lambda_{y_1}\eta_1 + \varepsilon_1$$

$$\eta_1 = \beta_{15}\eta_5 + \zeta_1$$

and $$\eta_5 = \beta_{56}\eta_6 + \zeta_5$$

By substitution it follows that y_1 may be expressed as:

$$y_1 = \lambda_{y_1}\beta_{15}\beta_{56}\eta_6 + \lambda_{y_1}\beta_{15}\zeta_5 + \lambda_{y_1}\zeta_1 + \varepsilon_1$$

The variables y_9, y_{10} may be expressed as:

$$y_9 = \lambda_{y_9}\eta_6 + \varepsilon_9$$

$$y_{10} = \lambda_{y_{10}}\eta_6 + \varepsilon_{10}$$

For the standardised model, where $Var(\eta_j) = 1$ and it is assumed that $Cov(\eta_j\zeta_i) = Cov\ (\varepsilon_i\varepsilon_j) = 0$, the variances and covariances of these variables may be expressed as:

$$\sigma_{1,9} = E(y_1 \times y_9)$$

$$= \lambda_{y_1}\lambda_{y_9}\beta_{15}\beta_{56} \qquad (1)$$

$$\sigma_{1,10} = \lambda_{y_1}\lambda_{y_{10}}\beta_{15}\beta_{56} \qquad (2)$$

$$\sigma_{9,10} = \lambda_{y_9}\lambda_{y_{10}} \qquad (3)$$

$$\sigma_{1,1} = \lambda_{y_1}^2(\beta_{15}^2\beta_{56}^2 + \beta_{15}^2 + 1) + \Theta_{\varepsilon_1} \qquad (4)$$

$$\sigma_{9,9} = \lambda_{y_9}^2 + \Theta_{\varepsilon_9} \qquad (5)$$

$$\sigma_{10,10} = \lambda_{y_{10}}^2 + \Theta_{\varepsilon_{10}} \qquad (6)$$

Estimates of λ_{y_9} and $\lambda_{y_{10}}$ can be obtained from equations (1), (2) and (3) as follows:

From equations (1) and (2)

$$\frac{\lambda_{y_1}\lambda_{y_9}\beta_{15}\beta_{56}}{\lambda_{y_1}\lambda_{y_{10}}\beta_{15}\beta_{56}} = \frac{\sigma_{1,9}}{\sigma_{1,10}} \qquad \left[\frac{(1)}{(2)}\right]$$

$$\frac{\lambda_{y_9}}{\lambda_{y_{10}}} = \frac{\sigma_{1,9}}{\sigma_{1,10}}$$

Multiply through by equation (3)

$$\frac{\lambda_{y_9}^2\lambda_{y_{10}}}{\lambda_{y_{10}}} = \frac{\sigma_{1,9}\ \sigma_{9,10}}{\sigma_{1,10}} \qquad [\times (3)]$$

$$\lambda_{y_9} = \frac{\sigma_{1,9}\ \sigma_{9,10}}{\sigma_{1,10}}$$

Similarly $\lambda_{y_{10}} = \dfrac{\sigma_{1,10}\ \sigma_{9,10}}{\sigma_{1,9}}$

Thus λ_{y_9} and $\lambda_{y_{10}}$ are identified, since it is possible to express these coefficients in terms of the known covariances of the observed y_i variables. Clearly the parameter β_{56} is also identified since from equation (4) (for example) β_{56} may be expressed in terms of the covariances of y_1, y_9, y_{10} and the variables λ_{y_1}, β_{15} whose identification status was established above:

$$\beta_{56} = \frac{\sigma_{19}}{\lambda_{y_1}\beta_{15}\ \dfrac{\sigma_{1,9}\ \sigma_{9,10}}{\sigma_{1,10}}}$$

This implies that the variance ψ_{55} is also identified since:

$$\psi_{55} = 1 - \beta_{56}^2$$

It is possible to show that Θ_{ε_9}, $\Theta_{\varepsilon_{10}}$ are identified from equations (5) and (6) where:

$$\Theta_{\varepsilon_9} = \sigma_{99} - \lambda_{y_9}^2$$

$$= \sigma_{99} - \frac{\sigma_{1,9}\ \sigma_{9,10}}{\sigma_{1,10}}$$

$$\Theta_{\varepsilon_{10}} = \sigma_{10,10} - \lambda_{y_{10}}^2$$

$$= \sigma_{10,10} - \frac{\sigma_{1,10}\ \sigma_{9,10}}{\sigma_{1,9}}$$

Clearly the unknown parameters in the defensiveness component of the model: λ_{y_9}, $\lambda_{y_{10}}$, β_{56}, ψ_{55}, Θ_{ε_9}, $\Theta_{\varepsilon_{10}}$ are all identified.

It has been demonstrated by the above methods that all the unknown parameters in the hierarchical model of self-esteem are identified. This means that under the constraints of the model, all the model parameters are uniquely defined (Joreskog & Sorbom, 1984). Since all the model parameters are identified, it is possible to say that the model as a whole is identified (Joreskog & Sorbom, 1984). It is now possible using LISREL methods to attempt to estimate the model.

APPENDIX II

SEI ITEMS AND SUBSCALE SCORE DISTRIBUTIONS

A2.1 SEI ITEMS

The SEI school form items are given below. Beside each item is a letter showing which SEI subscale each item belongs to. The subscales are denoted

G = General

A = Academic

S = Social

H = Home

D = Defensiveness

An X in the 'like me' response box indicates a high self-esteem item and an X in the 'unlike me' box indicates a low self-esteem item.

SEI ITEMS	Like Me	Unlike Me	
Things usually don't bother me	X		G
I find it very hard to talk in front of the class		X	A
There are lots of things about myself I'd change if I could		X	G
I can make up my mind without too much trouble	X		G
I'm a lot of fun to be with	X		S
I get upset easily at home		X	H
It takes me a long time to get used to anything new		X	G

SEI ITEMS	Like Me	Unlike Me	
I'm popular with kids my own age	X		S
My parents usually consider my feelings	X		H
I give in very easily		X	G
My parents expect too much of me		X	H
It's pretty tough to be me		X	G
Things are all mixed up in my life		X	G
Kids usually follow my ideas	X		S
I have a low opinion of myself		X	G
There are many times when I'd like to leave home		X	H
I often feel upset in school		X	A
I'm not as nice looking as most people		X	G
If I have something to say, I usually say it	X		G
My parents understand me	X		H
Most people are better liked than I am		X	S
I usually feel as if my parents are pushing me		X	H
I often get discouraged at school		X	A
I often wish I were someone else		X	G
I can't be depended on		X	G
I never worry about anything	X		D
I'm pretty sure of myself	X		G
I'm easy to like	X		S
My parents and I have a lot of fun together	X		H
I spend a lot of time daydreaming		X	G
I wish I were younger		X	G

SEI ITEMS	Like Me	Unlike Me	
I always do the right thing	X		D
I'm proud of my school work	X		A
Someone always has to tell me what to do		X	G
I'm often sorry for the things I do		X	G
I'm never happy	X		D
I'm doing the best work that I can	X		A
I can usually take care of myself	X		G
I'm pretty happy	X		G
I would rather play with children younger than I am		X	S
I like everyone I know	X		D
I like to be called on in class	X		A
I understand myself	X		G
No one pays much attention to me at home		X	H
I never get scolded	X		D
I'm not doing as well in school as I'd like to		X	A
I can make up my mind and stick to it	X		G
I really don't like being a boy/girl		X	G
I don't like to be with other people		X	S
I'm never shy	X		D
I often feel ashamed of myself		X	G
Kids pick on me very often		X	S
I always tell the truth	X		D
My teachers make me feel I'm not good enough		X	A
I don't care what happens to me		X	G

SEI ITEMS	Like Me	Unlike Me	
I'm a failure		X	G
I get upset easily when I'm scolded		X	G
I always know what to say to people	X		D

A2.2 SUBSCALE SCORE DISTRIBUTIONS

Eight measures of self-esteem and two measures of defensiveness were obtained for each subject (N = 843). These measures were the children's scores on split half forms of the five subscales of the SEI. The split halves of the general subscale were comprised of thirteen items each. Thus, for these measures, it was possible for subjects to obtain scores ranging from 0 to 13. The split halves of the remaining self-esteem subscales (academic, social and home) and the defensiveness subscale, were comprised of four items each. Thus, possible scores on these measures ranged from 0 to 4.

The table below presents the distributions of the subjects' observed scores on these measures. It is clear from the table that the observed scores were not normally distributed. Scores on the self-esteem measures were negatively skewed and scores on the defensiveness measures were positively skewed. These results are consistent with the typical SEI score distributions described by Coopersmith in the test manual (Coopersmith, 1981).

Table A2.1: Absolute and Relative Frequency of Observed Scores on Split Half Forms of the SEI Subscales

Possible Score	First Split Half Measure		Second Split Half Measure	
	Absolute Frequency	Relative Frequency (%)	Absolute Frequency	Relative Frequency (%)
General Subscale				
0	0	0.0	0	0.0
1	0	0.0	0	0.0
2	2	0.2	0	0.0
3	5	0.6	4	0.5
4	14	1.7	11	1.3
5	27	3.2	30	3.6
6	48	5.7	33	3.9
7	58	6.9	54	6.4
8	74	8.8	65	7.7
9	101	12.0	95	11.3
10	124	14.7	129	15.3
11	138	16.4	147	17.4
12	136	16.1	149	17.7
13	116	13.8	126	14.9
Total	843	100.0	843	100.0
Academic Subscale				
0	19	2.3	24	2.9
1	80	9.5	77	9.1
2	188	22.3	149	17.7
3	278	33.0	291	34.5

Table A2.1: continued

Possible Score	First Split Half Measure Absolute Frequency	First Split Half Measure Relative Frequency (%)	Second Split Half Measure Absolute Frequency	Second Split Half Measure Relative Frequency (%)
4	278	33.0	302	35.8
Total	843	100.0	843	100.0
Social Subscale				
0	5	0.6	12	1.4
1	30	3.6	69	8.2
2	120	14.2	152	18.0
3	262	31.1	335	39.7
4	426	50.5	275	32.6
Total	843	100.0	843	100.0
Home Subscale				
0	19	2.3	16	1.9
1	39	4.6	34	4.0
2	99	11.7	89	10.6
3	244	28.9	287	34.0
4	442	52.4	417	49.5
Total	843	100.0	843	100.0
Defensiveness Subscale				
0	377	44.7	202	24.0
1	269	31.9	360	42.7
2	153	18.1	210	24.9
3	44	5.2	64	7.6
4	0	0.0	7	0.8
Total	843	100.0	843	100.0

APPENDIX III

TESTS OF LINEARITY

The regression model in Chapter 4 (4.2) examines the relationships between self-esteem and a number of exogenous variables. The model assumes that the exogenous variables are related to self-esteem in a linear fashion. The data for testing this assumption are presented in the table below.

Linearity may be assessed from examination of the statistics eta (the correlation ratio) and r (the correlation coefficient) which are shown in the rows of the table. The squares of these statistics may be interpretted as follows:

(i) The square of eta is a measure of the total (linear and non-linear) variance in the self-esteem indicator which is explained by the exogenous variable.

(ii) The square of r is a measure of the proportion of variance in the self-esteem indicator which is a linear function of the exogenous variable.

Thus, the extent to which the relationship between a self-esteem indicator and an exogenous variable departs from linearity, may be assessed by a comparison of r^2 and eta-squared. The discrepancy between these statistics may be tested for significance using the F test of linearity (Guilford & Fruchter, 1973). If the difference between r^2 and eta-squared is statistically significant, this implies the presence of a non-linear relationship.

The table shows that the relationships between the self-esteem indicators and the exogenous variables did not differ significantly from linearity. There were three exceptions to this. These were the relationships between:

(i) standards of living and the first split half indicator of academic self-esteem

(ii) changes of parents and the first split half indicator of social self-esteem

(iii) changes of residence and the first split half indicator of home self-esteem.

The deviations from linearity in these cases were significant at the $p<.05$ level. These deviations all occurred for only one of a pair of self-esteem indicators. For example, the relationship of standards of living and the second split half indicator of academic self-esteem did not differ significantly from linearity. It is therefore likely that the deviations reflect idiosyncracies in the data rather than true non-linear trends.

Table A3.1: Mean Scores, Correlation Ratios, Correlation Coefficients and Deviations from Linearity for Self-Esteem Indicators by Exogenous Variables

Exogenous Variables	N	Mean Scores on Self-Esteem Indicators: General 1	General 2	Academic 1	Academic 2	Social 1	Social 2	Home 1	Home 2
Defensiveness 1	843								
0	377	9.59	9.92	2.65	2.82	3.21	2.85	3.13	3.23
1	269	9.82	10.11	2.89	2.93	3.25	2.91	3.32	3.25
2	153	10.40	10.31	3.13	3.05	3.38	3.15	3.39	3.31
3	44	10.30	10.36	3.30	3.14	3.55	3.11	3.30	3.25
4	0	-	-	-	-	-	-	-	-
eta		.127	.069	.197	.093	.099	.118	.112	.034
r		.119	.068	.197	.092	.094	.109	.096	.027
Deviation from Linearity		NS	NS	NS	NS	NS	NS	NS	NS
Defensiveness 2	843								
0	203	9.43	9.78	2.61	2.75	3.09	2.71	3.09	3.09
1	360	9.91	10.16	2.85	2.92	3.32	2.95	3.29	3.30
2	210	9.91	10.05	2.98	2.98	3.33	3.08	3.28	3.25
3	64	10.58	10.50	3.11	3.14	3.39	3.19	3.36	3.44
4	6	10.67	10.83	3.50	3.17	3.33	2.67	3.50	3.67
eta		.124	.087	.154	.103	.118	.154	.094	.112
r		.111	.069	.151	.099	.097	.136	.077	.088
Deviation from Linearity		NS	NS	NS	NS	NS	NS	NS	NS

Table A3.1: continued

Exogenous Variables	N	Mean Scores on Self-Esteem Indicators: General 1	General 2	Academic 1	Academic 2	Social 1	Social 2	Home 1	Home 2
Intelligence	820								
<90	172	9.13	9.19	2.69	2.72	3.25	2.72	3.15	2.98
90-98	147	9.54	9.71	2.77	2.78	3.20	2.87	3.16	3.27
99-105	181	9.77	10.06	2.75	2.86	3.25	2.96	3.18	3.19
106-115	160	10.19	10.45	2.88	3.05	3.24	3.05	3.27	3.35
>115	160	10.67	10.99	3.15	3.23	3.44	3.14	3.46	3.48
eta		.220	.265	.153	.176	.095	.153	.117	.180
r		.219	.265	.136	.171	.067	.152	.104	.165
Deviation from Linearity		NS	NS	NS	NS	NS	NS	NS	NS
Reading	838								
Very Poor	17	8.71	8.82	2.00	2.53	2.82	2.12	3.06	2.94
Poor	103	9.11	9.35	2.45	2.55	3.19	2.76	3.09	2.98
Average	302	9.46	9.69	2.72	2.76	3.24	2.85	3.15	3.15
Good	214	10.30	10.40	3.03	3.08	3.31	3.06	3.32	3.36
Very Good	202	10.41	10.72	3.14	3.22	3.36	3.10	3.41	3.44
eta		.217	.226	.251	.216	.098	.176	.123	.175
r		.207	.223	.245	.214	.086	.162	.120	.171
Deviation from Linearity		NS	NS	NS	NS	NS	NS	NS	NS

Table A3.1: continued

Exogenous Variables	N	Mean Scores on Self-Esteem Indicators: General 1	General 2	Academic 1	Academic 2	Social 1	Social 2	Home 1	Home 2
Written Expression	830								
Very Poor	26	8.50	9.42	2.15	2.31	3.04	2.50	3.08	2.96
Poor	115	9.01	9.23	2.50	2.58	3.11	2.63	3.10	2.92
Average	368	9.70	9.93	2.79	2.85	3.26	2.92	3.19	3.20
Good	209	10.36	10.53	3.03	3.14	3.24	3.04	3.38	3.45
Very Good	112	10.54	10.69	3.24	3.21	3.59	3.28	3.41	3.49
eta		.224	.203	.238	.216	.158	.199	.118	.205
r		.219	.193	.236	.211	.135	.195	.112	.195
Deviation from Linearity		NS	NS	NS	NS	NS	NS	NS	NS
Spelling	835								
Very Poor	35	8.51	8.97	2.14	2.51	2.97	2.34	2.91	2.89
Poor	144	9.35	9.42	2.56	2.60	3.22	2.76	3.17	3.01
Average	325	9.74	9.97	2.83	2.86	3.25	2.92	3.18	3.24
Good	206	10.22	10.50	2.94	3.12	3.22	3.02	3.34	3.34
Very Good	125	10.47	10.70	3.30	3.23	3.57	3.26	3.44	3.51
eta		.191	.207	.245	.210	.154	.198	.126	.179
r		.187	.204	.237	.210	.121	.190	.120	.177
Deviation from Linearity		NS	NS	NS	NS	NS	NS	NS	NS

Table A3.1: continued

Exogenous Variables	N	Mean Scores on Self-Esteem Indicators: General 1	General 2	Academic 1	Academic 2	Social 1	Social 2	Home 1	Home 2
Mathematics	835								
Very Poor	26	8.50	8.85	2.38	2.50	3.08	2.08	3.12	2.85
Poor	103	9.12	9.23	2.31	2.57	3.12	2.60	2.99	2.86
Average	350	9.55	9.73	2.78	2.83	3.22	2.92	3.17	3.19
Good	228	10.36	10.66	3.01	3.05	3.30	3.04	3.39	3.44
Very Good	128	10.66	10.89	3.29	3.31	3.52	3.28	3.44	3.48
eta		.239	.264	.271	.211	.140	.247	.150	.223
r		.235	.256	.263	.210	.134	.234	.140	.212
Deviation from Linearity		NS	NS	NS	NS	NS	NS	NS	NS
SES	843								
Unskilled	219	9.27	9.46	2.65	2.70	3.26	2.89	3.10	3.19
Skilled	454	10.00	10.19	2.89	2.93	3.27	2.90	3.25	3.22
Professional	170	10.19	10.55	2.98	3.14	3.31	3.11	3.44	3.40
eta		.144	.166	.114	.139	.018	.086	.118	.081
r		.134	.162	.109	.139	.015	.072	.118	.072
Deviation from Linearity		NS	NS	NS	NS	NS	NS	NS	NS

Table A3.1: continued

Exogenous Variables	N	Mean Scores on Self-Esteem Indicators: General 1	General 2	Academic 1	Academic 2	Social 1	Social 2	Home 1	Home 2
Standard of Living	843								
Very Poor	36	8.64	8.75	2.08	2.58	2.89	2.33	3.06	2.94
Poor	137	9.23	9.46	2.69	2.70	3.18	2.84	2.93	3.15
Average	459	9.93	10.10	2.91	2.92	3.32	2.95	3.31	3.25
Good	160	9.94	10.42	2.89	3.02	3.24	3.03	3.31	3.33
Very Good	51	11.29	11.25	3.22	3.33	3.47	3.24	3.51	3.51
eta		.209	.212	.187	.147	.123	.159	.161	.111
r		.188	.207	.152	.143	.085	.142	.130	.107
Deviation from Linearity		NS	NS	p<.05	NS	NS	NS	NS	NS
Gender	843								
Boy	422	9.98	10.29	2.86	2.90	3.30	2.94	3.26	3.29
Girl	421	9.72	9.86	2.83	2.93	3.25	2.94	3.24	3.21
eta		.055	.093	.017	.012	.031	.001	.009	.043
r		-.055	-.093	-.017	.012	-.031	.001	-.009	-.043
Deviation from Linearity *		-	-	-	-	-	-	-	-

Table A3.1: continued

Exogenous Variables	N	Mean Scores on Self-Esteem Indicators: General 1	General 2	Academic 1	Academic 2	Social 1	Social 2	Home 1	Home 2
Maternal Age	843								
<20	76	9.30	9.61	2.66	2.79	3.25	2.93	3.07	3.28
20-24	255	9.74	9.83	2.79	2.87	3.23	2.91	3.22	3.23
25-29	331	9.96	10.20	2.88	2.94	3.34	2.94	3.26	3.25
>29	181	10.03	10.37	2.95	2.97	3.24	2.98	3.35	3.27
eta		.085	.108	.079	.049	.057	.028	.075	.017
r		.078	.106	.078	.047	.014	.023	.072	.007
Deviation from Linearity		NS	NS	NS	NS	NS	NS	NS	NS
Maternal Education	843								
No Formal	439	9.64	9.77	2.80	2.81	3.28	2.90	3.15	3.16
Secondary	248	10.02	10.28	2.84	3.03	3.25	2.97	3.34	3.30
Tertiary	156	10.16	10.58	2.98	3.03	3.28	3.01	3.37	3.42
eta		.092	.140	.062	.102	.018	.044	.105	.106
r		.089	.139	.058	.091	-.006	.044	.098	.106
Deviation from Linearity		NS	NS	NS	NS	NS	NS	NS	NS

Table A3.1: continued

Exogenous Variables	N	Mean Scores on Self-Esteem Indicators: General 1	General 2	Academic 1	Academic 2	Social 1	Social 2	Home 1	Home 2
Birth Order	843								
First	318	9.96	10.20	2.88	2.95	3.34	2.97	3.25	3.33
Second	303	9.92	10.07	2.88	2.99	3.29	2.91	3.23	3.25
Third	159	9.61	9.92	2.78	2.81	3.18	2.97	3.34	3.18
Fourth or more	63	9.50	9.79	2.67	2.65	3.10	2.86	3.11	3.03
eta		.067	.055	.061	.092	.086	.035	.057	.090
r		-.062	-.055	-.054	-.074	-.084	-.018	-.002	-.089
Deviation from Linearity		NS	NS	NS	NS	NS	NS	NS	NS
Ethnicity	843								
Pakeha	740	9.92	10.11	2.85	2.93	3.28	2.94	3.26	3.25
Polynesian	103	9.37	9.82	2.81	2.82	3.25	2.95	3.14	3.23
eta		.074	.041	.015	.034	.009	.005	.042	.007
r		-.074	-.041	-.015	-.034	-.009	.005	-.042	-.007
Deviation from Linearity *		-	-	-	-	-	-	-	-

Table A3.1: continued

Exogenous Variables	N	Mean Scores on Self-Esteem Indicators: General 1	General 2	Academic 1	Academic 2	Social 1	Social 2	Home 1	Home 2
Changes of Parents	843								
None	656	10.09	10.29	2.91	2.97	3.31	2.99	3.32	3.30
1	86	9.17	9.53	2.67	2.78	3.16	2.78	3.09	3.16
2,3,4	76	8.89	9.30	2.46	2.61	3.03	2.68	2.93	3.09
>4	25	8.84	8.64	2.84	2.76	3.48	2.84	2.80	2.84
eta		.186	.181	.134	.110	.108	.108	.148	.106
r		-.178	-.179	-.108	-.101	-.056	-.095	-.148	-.104
Deviations from Linearity		NS	NS	NS	NS	p<.05	NS	NS	NS
Changes of Residence	843								
None	261	10.26	10.39	2.98	3.05	3.38	3.05	3.36	3.34
1	209	9.96	10.13	2.87	2.87	3.22	2.94	3.24	3.22
2,3,4	187	9.56	9.90	2.88	2.87	3.25	2.87	3.17	3.22
5,6,7	96	9.54	9.79	2.61	2.79	3.23	2.89	3.40	3.25
>7	90	9.34	9.64	2.59	2.83	3.20	2.82	2.93	3.12
eta		.138	.112	.130	.091	.085	.083	.137	.073
r		-.133	-.110	-.120	-.076	-.064	-.077	-.091	-.061
Deviation from Linearity		NS	NS	NS	NS	NS	NS	p<.05	NS

Table A3.1: continued

Exogenous Variables	N	Mean Scores on Self-Esteem Indicators: General 1	General 2	Academic 1	Academic 2	Social 1	Social 2	Home 1	Home 2
Changes of School	843								
None	3	12.00	12.33	3.67	3.67	3.65	4.00	3.33	4.00
1	597	10.04	10.23	2.93	2.96	3.33	3.03	3.29	3.28
2	164	9.51	9.79	2.70	2.82	3.10	2.73	3.24	3.24
3	55	9.41	9.82	2.71	2.75	3.25	2.73	3.00	3.02
4	16	8.75	9.00	2.06	2.75	3.19	2.69	2.94	3.19
>4	8	6.63	6.88	2.00	2.38	2.63	2.38	2.50	2.63
eta		.184	.180	.168	.096	.131	.161	.113	.107
r		-.167	-.153	-.154	-.087	-.099	-.141	-.103	-.085
Deviation from Linearity		NS	NS	NS	NS	NS	NS	NS	NS

* It is not possible to test dichotomous variables for departure from linearity